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JUNIPERUS PROCERA HOCHST.

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Plate 4

THE East African Cedar (*Juniperus procera* Hochst.) is the giant of the genus, being sometimes 150 feet tall with a trunk 30 feet in girth. It is distributed from the mountains of Abyssinia southward over the highlands and mountains of Kenya southeast to the Kilimanjaro range in Tanganyika. Its western limits appear to be Mt. Elgon in north-eastern Uganda. The altitudinal range of the Juniper is from 5000 to 10,000 feet above sea-level, but its greatest perfection and abundance is between elevations of from 7000 to 9000 feet. Within its altitudinal range distribution is governed very largely by rainfall. It is most luxuriant where the rainfall averages from 40 to 55 inches per year. In this belt it forms magnificent forests, either pure or mixed with a miscellany of hard-wood trees. It is found in a more or less stunted condition in savannah areas where the annual rainfall is as low as 25 inches. Where the yearly precipitation exceeds 55 inches this Juniper gives place to more moisture-loving broad-leaved evergreen trees and is entirely absent.

In Kenya, beyond Nairobi, on the uplands at Lari westward to Kinobop and elsewhere round the base of the Aberdare mountains, the tree is most abundant and in greatest perfection. The average height is from 80 to 120 feet with a trunk from 15 to 18 feet in girth. Under most favorable conditions the bole is often free of branches for a length of from 50 to 60 feet. Occasionally it forms pure forests but more usually it is mixed with *Podocarpus gracilior* Pilger, *Olea chrysophylla* Lam., *O. Hochstetteri* Baker, *Nuxia congesta* R. Br., and certain other broad-leaved trees.

In its youth the African Cedar is pyramidal in outline with lance-shaped leaves after the manner of its relatives, the Red Cedar (*Juniperus virginiana* L.) and the Chinese Juniper (*J. chinensis* L.). At maturity it has a wide-spreading, round-topped crown from 50 to 60 feet through, made up of thick branches clothed with light green foliage. The bole is erect and massive and is clothed with thin, gray or gray-brown bark, fibrous and stringy in texture. The tree is dioecious and produces

flowers very abundantly. The 2- to 3-seeded fruit is about the size of a garden pea, blue-black in color. The leaves on the adult tree are all small and scale-like.

Like its American relative, the East African Cedar is a lover of open country, and, except in its youth, a light-demanding tree. In the semi-dry savannah regions it occurs as a scattered tree, seldom more than 60 feet tall, with a short, very thick trunk and an abnormally wide-spreading crown. Where it forms pure forests it is lofty with a small crown and a less massive trunk.

Under pure forest conditions the seeds of the Juniper do not vegetate except on the outskirts or in glades. Among mixed trees but more especially in the open grass-clad areas and where shrubs grow the seeds vegetate freely. Its natural nurse appears to be *Hypericum lanceolatum* Lam. which is a very common bush or small tree with handsome red-brown bark and large clear yellow flowers.

All in all this Juniper is the most valuable timber tree of the highland forests of eastern Africa. The wood varies in color from pale to rich cedar-brown and is very fragrant. It is not attacked by termites, is exceedingly durable in the ground, and is excellent for panelling, for window sashes, for shingles, for pillars, etc. It is difficult to nail since it cracks and splits readily. Although somewhat harder than that of *Juniperus virginiana* L. the wood is well-suited for making writing pencils. Unfortunately most of the trees, in Kenya at least, are over-mature, and the timber exceedingly faulty from ingrowing bark and from fungus attacks, moreover, many of the trees are badly infested with a species of Mistletoe. The Forestry Officers of Kenya, appreciating the great value of this tree, are now placing it under safe control. The over-mature trees are being removed and proper silvicultural methods applied to the forests. Also, it is being raised in immense quantities from seeds, new plantations are rapidly being made and the future of this most useful timber tree is now assured.

It appears to have been discovered by Wilhelm Schimper, sometimes before 1844, near the church Adda Mariam at Enschedcap, near Tche-tatchekamme, in the region of Chohoo, and at Quodgerate Listchedcap, and Semen in Abyssinia. At what date it was introduced into cultivation I have not been able to ascertain but there is a specimen in this herbarium from a plant cultivated in the grounds of the Southern Californian Acclimatizing Association, Santa Barbara in 1898. In 1921, I paid a special visit to Kenya for the purpose of studying and photographing this tree, and sent home a quantity of seeds which were widely distributed by the Arnold Arboretum.

NEW CHINESE LIGNEOUS PLANTS

E. D. MERRILL

IN this paper twenty-one presumably new species of Chinese woody plants are described and two genera new to China recorded from material that has recently been submitted to me for study. Most of the species considered are from Kwangtung Province being represented in the collections made under the auspices of Dr. F. R. Wulsin, representing the National Geographic Society, who coöperated with the Canton Christian College (now Ling Nan University) in a rather extensive exploration of the North River region in Kwangtung Province in 1924. The actual field work was done by three Chinese collectors employed by the latter institution, Messrs. To Kang Peng, Ts'ang Wai Tak, and Ts'ang Un Kin. Other species considered are largely based on material submitted to me for identification by A. N. Steward, of the University of Nanking, with a few from other sources. The study set of these collections is deposited in the Herbarium of the University of California, but the actual types of those species based on the Wulsin Expedition collection are in the United States National Herbarium.

The Wulsin Expedition Kwangtung collections comprise approximately 1000 numbers, the collections being divided between the Canton Christian College and the United States National Herbarium, half the duplicates of each number being retained in Canton, and half forwarded to me in Berkeley, which, after identification were transmitted to the United States National Herbarium, except for one set that was retained in Berkeley. The collection is rather important because, in addition to the sixteen species herein described as new, it added about twenty genera and fifty species, previously described by various authors, to the list of those known from Kwangtung Province. A paper recording the previously described genera and species new to the Kwangtung flora has recently been submitted to F. A. McClure for publication in the Lingnaam Agricultural Review.

MORACEAE

Ficus Linnaeus*Ficus kwangtungensis*, sp. nov. (§Eusyce).

Frutex erectus, multiramosus, ramulis junioribus fructibusque exceptis glaber, ramis teretibus, glabris, rubro-brunneis, ramulis tenuibus, elongatis, 1-1.5 mm. diametro, novellis adpresse pubescentibus: foliis lanceolatis ad oblongo-lanceolatis, 3-6.5 cm. longis, 1-2 cm. latis, integris, subcoriaceis, pallide olivaceis vel olivaceo-viridibus, utrinque subconcoloribus, laevibus, basi obtusis ad acutis, apice perspicue subcaudato-acuminatis, subtus minute crebreque foveolatis, nervis primariis utrinque circiter 10, subtus distinctis, paullo elevatis, arcuato-anastomosantibus; petiolo 4-5 mm. longo, pubescenti; stipulis lanceolatis, acu-

minatis, circiter 3 mm. longis, deciduis, parce pubescentibus; receptaculis axillaribus, solitariis, breviter pedunculatis, globosis, 5-6 mm. diametro, disperse adpresseque hirsutis, laevibus; pedunculis 1.5-2 mm. longis, leviter pubescentibus; bracteis 3, triangulari-ovatis, acuminatis, circiter 1 mm. longis, adpresse pubescentibus; floribus masculis perianthii segmentis 3, rubro-brunneis, oblongo-ellipticis, plus minusve cucullatis, obtusis, 1 mm. longis, antheris 2, anguste oblongis, 0.8 mm. longis; floribus femineis haud visis, galliferis numerosis, segmentis oblongis ad oblongo-lanceolatis, rubro-brunneis, curvatis, glabris, circiter 1.5 mm. longis.

KWANGTUNG PROVINCE: near Fung Wan, North River region, July 14, 1924, Canton Christian College no. 12832 (Wulsin Expedition).—A shrub in rocky places; local name "ngau nai t'ung."

I have not been able to refer this distinctly characteristic species to any hitherto described form. It is well characterized by its small, lanceolate, conspicuously acuminate, glabrous leaves which are minutely and densely foveolate on the lower surface, in the latter character approaching some forms placed in the group with *Ficus foveolata* Wall.; as well as by its small globose, shortly peduncled, smooth, sparingly appressed-hirsute receptacles. In habit, which is strictly erect, it is remote from Wallich's species and the others generally placed in this alliance, yet I believe that its true alliance is with this group.

LORANTHACEAE

Loranthus Linnaeus

Loranthus kwangtungensis, sp. nov.

Frutex parasiticus, partibus junioribus inflorescentiisque parce pubescentibus exceptis glaber, ramis ramulisque teretibus, ramis glaberrimis, parce lenticellatis, ramulis circiter 1.5 mm. diametro, parce brevissime pubescentibus glabrescentibus; foliis crasse coriaceis, fragilibus, oblongo-ellipticis ad anguste obovatis, apice rotundatis, basi acutis, utrinque glabris, in sicco verruculosi, olivaceis vel flavido-brunneis, subtus paullo pallidioribus, 6-8 cm. longis, 2.5-4 cm. latis, costa utrinque distincta, nervis lateralibus venulisque obsoletis; petiolo 6-9 mm. longo; inflorescentiis axillaribus, solitariis, racemosis, paucifloris, vix 1 cm. longis, subferrugineo-pubescentibus; floribus 2-5, rubris vel deorsum flavidis, 4-meris, 3-3.2 cm. longis, curvatis, parvis pubescentibus; pedicellis circiter 4 mm. longis; calycibus cylindraceis, leviter pubescentibus, rugosis, circiter 3 mm. longis, 2 mm. diametro, limbo vix producto, truncato; corollae tubo circiter 1.6 cm. longo, deorsum leviter inflato, lobis (partibus reflexis) anguste oblongis, obtusis, circiter 6 mm. longis, 1.5 mm. latis; filamentis glabris, 2 mm. longis, antheris continuis, 3.5 mm. longis.

KWANGTUNG PROVINCE: Chaa Uen Shan and Tung Tsz Haang, Wai Chung Peng, Lung T'au Mountain, North River region, F. A.

McClure, nos. 13788, 13755 (type), January, 1926. Parasitic on magnoliaceous and other trees in forested ravines, flowers red or red with a yellow base.

This differs essentially from *Loranthus yadoriki* Sieb. & Zucc., from which *Loranthus Levinei* Merr. is doubtfully distinct, in its leaves being entirely glabrous on both surfaces and in its nearly glabrous flowers. *Loranthus nigrans* Hance, judging from the description, differs in its dense indumentum; the latter species is apparently very close to *L. yadoriki* Sieb. & Zucc.

MAGNOLIACEAE

Magnolia Linnaeus

Magnolia kwangtungensis, sp. nov.

Arbor 5-12 m. alta, ramis glabris, cicatricibus perspicuis instructis, ramulis circiter 5 mm. diametro, partibus junioribus densissime fulvo-ad cupreo-villosis: foliis coriaceis, ut videtur haud deciduis, oblongis ad oblongo-ellipticis, 15-20 cm. longis, 5-7 cm. latis, apice obtusis ad perspicue obtuseque acuminatis, basi acutis ad cuneatis, supra glaberrimis, nitidis, in sicco pallidis ad pallide viridibus, subtus plerumque brunneis, disperse fulvo- ad cupreo-villosis, costa subtus elevata, valde perspicua, subdense villosa, nervis lateralibus utrinque circiter 12, tenuibus, haud perspicuis, arcuato-anastomosantibus, reticulo venularum laxo; petiolo densissime fulvo- ad cupreo-villoso, 2-3 cm. longo; floribus terminalibus, albidis, erectis, solitariis, saltem 4 cm. longis, pedunculo 3-7 cm. longo, densissime villosa; sepalis petalisque saltem 9, coriaceis, glabris, oblongo-ellipticis ad oblongo-obovatis, circiter 4 cm. longis, 2 cm. latis, verruculosi; antheris numerosissimis, circiter 1.2 cm. longis, curvatis; carpellis confertis, numerosis, glabris, circiter 8 mm. longis, irregulariter oblanceolatis, apice acuminatis.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, May and June, 1924, Canton Christian College nos. 12179, 12344 (type), 12548 (Wulsin Expedition). A tree in forested ravines.

The first number cited bears the native name "mo t'o," the second "shan p'i p'a," and the third two field labels with two different names, one "mo t'o," the other "mo kau un"; both of these labels bear the further statement: "heung koo tree."

The species is, I believe, closely allied to *Magnolia Fordiana* Hu (*Manglietia Fordiana* Oliver), from which it is at once distinguished by its fulvous to cupreous indumentum.

LAURACEAE

Phoebe Nees

Phoebe acuminata, sp. nov.

Arbor circiter 10 m. alta, ramis ramulisque glabris vel ramulis parcissime villosis, in sicco subpurpureis ad rubro-purpureis, laevibus, tereti-

bus, ramulis circiter 2 mm. diametro; foliis lanceolatis, coriaceis vel subcoriaceis, in sicco pallidis, supra glaberrimis, nitidis, subtus pallide ferrugineis, disperse pallide villosis praesertim ad costam nervosque, 6-12 cm. longis, 2-2.7 cm. latis, utrinque subaequaliter angustatis, basi cuneatis, apice tenuiter acuminatis, nervis primariis utrinque circiter 10, supra haud distinctis, subtus perspicuis, elevatis, curvato-adscendentibus, obscure anastomosantibus, reticulo venularum distincto; petiolo 1-1.5 cm. longo, leviter villoso; inflorescentiis in axillis superioribus, longe pedunculatis, paucifloris, plus minusve subcinereo-pubescentibus, 6-8 cm. longis; floribus 5-10, albidis, circiter 6 mm. longis, pedunculo 4-5 cm. longo; sepalis rigidis, erectis, ellipticis, obtusis, 3.5-4 mm. longis, coriaceis, imbricatis, utrinque breviter pubescentibus; staminibus interioribus circiter 2.5 mm. longis, distincte villosis, antheris oblongis, truncatis, glandulis glabris vel subglabris, sessilibus, circiter 0.5 mm. diametro, staminibus exterioribus (6) quam interioribus paullo longioribus, minus pubescentibus; staminodiis sagittatis, stipitatis, usque ad 2 mm. longis, villosis; ovario glabro, stylis 1.5 mm. longis.

KWANGTUNG PROVINCE: Lung Tau Mountain, near Iu, North River region, June 3, 1924, Canton Christian College no. 12379 (Wulsin Expedition). In forested ravines; local name "tung kau shu."

A species characterized by its sparse villous indumentum, and its lanceolate, pale, sharply and conspicuously acuminate narrow leaves nerved beneath. In general it belongs in the group with *Phoebe Sheareri* Gamble, but is remote from that species.

HAMAMELIDACEAE

Liquidambar Linnaeus

Liquidambar edentata, sp. nov.

Species *L. formosanae* affinis, differt foliis minoribus, margine integris, haud crenatis vel dentatis. Ut videtur arbor parva, inflorescentiis exceptis glabra, ramis ramulisque tenuibus, laevibus, teretibus, nitidis, olivaceis, ramulis vix 1 mm. diametro; foliis viridibus, nitidis, ovatis, 3-lobatis, membranaceis, 5-8 cm. longis, 3.5-7 cm. latis, basi rotundatis, 3-nerviis, subtus in axillis barbatis, margine integris, lobis lateralibus patulo adscendentibus, longe acuminatis, 2-3 cm. longis, e basi ovata, lanceolatis, centrali quam lateralibus longiore, iis simillimo, 3-5 cm. longis; petiolo tenui, 1.5-6.5 cm. longo; pedunculis elongatis, glabris, capitulis femineis junioribus globosis, circiter 2 cm. diametro, stylis pubescentibus, lineari-lanceolatis, curvatis, circiter 9 mm. longis.

FUKIEN PROVINCE: without definite locality, probably from near Foochow, *F. P. Metcalf* and *T. C. Chang*, no. 877.

Manifestly allied to *Liquidambar formosana* Hance but with distinctly smaller leaves, their margins, aside from the three prominent lobes, quite entire, not at all toothed, base rounded, not at all cordate.

SAXIFRAGACEAE

Hydrangea Linnaeus

Hydrangea kwangtungensis, sp. nov. (§ *Euhdrangea*, *Heteromallae*).

Frutex erectus, circiter 1 m. altus, perspicue villosus, ramis ramulisque brunneis, villosis, ramulis circiter 2 mm. diametro; foliis lanceolatis ad oblongo-lanceolatis, membranaceis, mollibus, 5–11 cm. longis, 1.5–3 cm. latis, in sicco pallide viridibus, subtus paullo pallidioribus, utrinque subaequaliter angustatis, basi acutis, apice acuminatis, margine distanter apiculato-serrulatis ad integris, in parte inferiore semper integris, utrinque molliter villosis pilis dispersis subpatulis pallidis, nervis primariis utrinque circiter 6, tenuibus, distinctis, curvato-adscententibus, arcuato-anastomosantibus, reticulo venularum laxo; petiolo dense villosus, 4–8 mm. longo; cymis densis, convexis, circiter 5 cm. diametro, dense molliter villosis, multifloris; floribus albidis, omnibus fertilibus, parvis, 5-meris, pedicellis usque ad 4.5 mm. longis; calycis tubo disperse villosus, lobis 5, oblongo-ovatis, acutis, circiter 1.4 mm. longis, membranaceis, utrinque parvissime villosis; petalis membranaceis, liberis, deciduis, glabris, oblongo-ellipticis ad anguste oblongo-obovatis, 3 mm. longis, acutis ad leviter acuminatis; staminibus 10, glabris, filamentis ad 1.5 mm. longis, antheris ellipsoideis, vix 1 mm. longis; stylis 3 vel 4, circiter 1 mm. longis, ovario infero; floribus sterilibus radiantibus nullis.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, May 22, 1924, Canton Christian College no. 12017 (Wulsin Expedition).

A species in some respects resembling *Hydrangea villosa* Rehder but differing in numerous details. In the material at hand there is no indication of any sterile radial flowers. It is well characterized by its soft villous indumentum.

LEGUMINOSAE

Caesalpinia Linnaeus

Caesalpinia kwangtungensis, sp. nov.

Species *C. nugae* Ait. affinis, differt leguminibus minoribus, valde inaequilateraliter ovatis, basi uno latere latissime rotundatis altero acutis, apice perspicue acuminatis. Frutex scandens, glaber (floribus ignotis), ramis ramulisque teretibus, laevibus, nitidis, atro-olivaceis; foliis 15–25 cm. longis, bipinnatis, rhachi infra spinis brevibus recurvatis instructa; pinnis circiter 5-jugis, usque ad 9 cm. longis, rhachi haud spinosa, foliolis 4–5-jugis, ellipticis ad obovato-ellipticis, aequilateralibus, chartaceis ad subcoriaceis, pallide olivaceis, nitidis, subtus pallidioribus, utrinque glaberrimis, dense reticulatis, 2–3 cm. longis, 1–1.8 cm. latis, apice obtusis ad rotundatis, basi late acutis, nervis primariis utrinque circiter 10, distinctis, petiolulis 1–2 mm. longis; infructescentiis paniculatis, ramis ultimis usque ad 10 cm. longis, fructibus racemose dispositis; leguminibus compressis, valde oblique ovoideis, castaneis, leviter

reticulatis, glabris, 2-3 cm. longis, 1.7-2 cm. latis, basi uno latere latis-sime rotundatis, altero attenuato, apice perspicue acuminatis, seminibus ut videtur solitariis; pedicellis 1-1.5 cm. longis.

KWANGTUNG PROVINCE: near Fung Wan Hu, among rocks, North River region, July 14, 1924, Canton Christian College no. 12838 (Wulsin Expedition).

A species with vegetative characters clearly approaching those of *Caesalpinia nuga* Ait. and *C. szechuenensis* Craib, differing from both in its peculiarly and strongly inequilateral pods, the narrower side acute at the base and only slightly curved, the broader side broadly rounded at the base and semicircular in outline.

EUPHORBIACEAE

Discocleidion Pax & K. Hoffmann

Discocleidion glabrum, sp. nov.

Frutex erectus, glaber, ramis ramulisque teretibus, laevibus, vel ramis leviter lenticellatis; foliis alternis, ovatis ad oblongo-ovatis, chartaceis, viridibus, utrinque subconcoloribus, 8-15 cm. longis, 4-9 cm. latis, longe acuminatis, basi rotundatis, 3-nerviis, subtus utrinque 1-3-maculari-glandulosis, stipellatis, margine perspicue crenato-serratis, nervis utrinque praeter basales 4 vel 5, adscendentibus, subtus perspicuis; petiolo 1-6 cm. longo; stipulis anguste lanceolatis, acuminatis, circiter 4 mm. longis, stipellis oblongis, incrassatis, obtusis, 1-2 mm. longis; inflorescentiis femineis glabris, depauperato-paniculatis, folia aequantibus, paucifloris, pedicellis usque ad 5 mm. longis, bracteis oblongo-ovatis, acuminatis, circiter 2 mm. longis, eglandulosis; sepalis plerumque 4, ovatis ad lanceolatis, acuminatis, glaberrimis, 2-2.5 mm. longis; ovario glabro, laevi; stylis 3, bifidis, 2 mm. longis, papillosis.

ANHWEI PROVINCE: Wu Yuen, *K. Ling*, no. 7866, August 24, 1924; a shrub near streams.

Although the staminate flowers are unknown I have not hesitated in placing this in *Discocleidion* rather than in *Alchornea* because of the very short cleft styles. The plant is entirely glabrous except that in some flowers examined the rounded angles of the ovary are supplied with a line of short appressed hairs. If correctly placed within the genus *Discocleidion* the species is most closely allied to *D. ulmifolium* (Muell. Arg.) Pax & Hoffm. of the Liu Kiu Islands, differing in its much larger leaves.

AQUIFOLIACEAE

Ilex Linnaeus

Ilex kwangtungensis, sp. nov. (§ *Euilex*, *Leioprinus*?).

Arbor parva, 3-6 m. alta, ramis teretibus, atris vel atro-purpureis, ramulis disperse breviter subferrugineo-pubescentibus, plus minusve compressis, circiter 2 mm. diametro; foliis subcoriaceis ad coriaceis,

rigidis, oblongo-ellipticis ad oblongo-ovatis, 8-14 cm. longis, 3-6 cm. latis, basi acutis ad rotundatis, apice distincte acuminatis, margine plerumque revolutis, minute serrulatis, interdum integris vel subintegris, supra atro-olivaceis, subtus brunneis, epunctatis, utrinque parce disperse breviter pubescentibus glabrescentibus, nervis primariis utrinque 8-10, subtus perspicuis, elevatis, arcuato-anastomosantibus, reticulo venularum laxissimo; petiolo 1-1.5 cm. longo; inflorescentiis axillaribus, pedunculatis, solitariis, parce breviter subcinereo-pubescentibus, circiter 10-floris, subcymosis, circiter 3 cm. longis, plerumque bracteis solitariis foliaceis lanceolatis usque ad 1.5 cm. longis instructis, pedunculo circiter 1 cm. longo; pedicellis 5-10 mm. longis; floribus rubris, 4-meris, circiter 6 mm. diametro; sepalis orbiculari-ovatis, rotundatis, subcinereo-puberulis, coriaceis, 1-1.5 mm. diametro; corollae lobis patulis, ellipticis, glabris, rotundatis, 3 mm. longis; antheris sterilibus ovoideis, obtusis, 1.2 mm. longis, quam filamenta paullo longioribus; ovario glabro, 4-loculari, ovoideo.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, June and July, 1924, Canton Christian College, nos. 12383, 12471 (type), 12764 (Wulsin Expedition). In forested ravines, local names "sai fui shu, yau lap shu."

I am by no means certain that this has been placed in its proper section, although it clearly appears to represent an undescribed form. It is characterized by its sparse, short indumentum, its coriaceous, minutely toothed leaves, and its relatively large flowers. The inflorescences are distinctly subcymose, the short branchlets frequently 3-flowered.

THEACEAE

Thea Linnaeus.

Thea microphylla, sp. nov. (§ *Camellia*).

Frutex, ramulis et petiolis et foliis supra ad costam plus minusve pubescentibus, ramis glabris, subcinereis, ramulis tenuibus, 0.5-1 mm. diametro, junioribus breviter hirsutis; foliis oblongo-ellipticis ad anguste elliptico-obovatis, 2-2.5 cm. longis, 7-12 mm. latis, coriaceis vel subcoriaceis, olivaceis ad olivaceo-viridibus, nitidis, utrinque subconcoloribus, disperse verruculosi, apice obtusis ad rotundatis, basi cuneatis, margine crenulatis ad crenulato-denticulatis, dentibus minute apiculatis, nervis primariis utrinque circiter 4, distantibus, obscuris, reticulo venularum laxo subobsoleto; petiolo 1-2 mm. longo, leviter hirsuto; alabastris axillaribus, solitariis, sessilibus, bracteis glabris vel ad apicem plus minusve pubescentibus, ovatis, coriaceis, 2-3 mm. longis; fructibus sessilibus, subovoideis, circiter 1.5 cm. diametro, verruculosi, junioribus leviter pubescentibus, irregulariter dehiscentibus, seminibus ut videtur plerumque 2, circiter 1.2 cm. longis; sepalis deciduis.

ANHWEI PROVINCE: Wu yuen and Shu Ling Shien, *N. K. Ip*, no. 7686,

K. Ling, no. 7830, August, 1924. In level low lands and in bamboo forests.

Although the flowers are unknown this is clearly a representative of the genus *Thea*, and of the section *Camellia* Szysz. It is sharply defined by its very small, rounded to obtuse, obscurely nerved leaves which do not exceed 2.5 cm. in length. A sterile specimen from Chekiang Province, *R. C. Ching*, No. 2160, from between Ping Yung and Tai Suan probably represents the same species, its branchlets and younger branches being clothed with long, weak, spreading pale hairs.

Ternstroemia Mutis

***Ternstroemia nitida*, sp. nov.**

Species *T. gymnantherae* Sprague (*T. japonicae* auctt.) affinis, differt foliis tenuioribus, utrinque valde nitidis, nervis lateralibus distinctis.— Arbor glaberrima, 10–13 m. alta, ramis teretibus, ramulis 2–2.5 mm. diametro; foliis integris, firme chartaceis ad subcoriaceis, oblongo-ellipticis ad anguste oblongo-obovatis, 6–10 cm. longis, 2.5–4 cm. latis, apice distincte sed obtuse acuminatis, basi cuneatis, in sicco utrinque valde nitidis, supra atro-olivaceis ad pallide olivaceis, subtus paullo pallidioribus, nervis primariis utrinque 7–9, tenuibus, subtus distinctis, arcuato-anastomosantibus, reticulo venularum laxo; petiolo 1–1.5 cm. longo; floribus masculis axillaribus, solitariis, albidis, pedicellis circiter 1 cm. longis; sepalis 5, coriaceis, glabris, ellipticis ad late ellipticis, rotundatis, margine integerrimis, 5 mm. longis; petalis ovatis, glabris, late rotundatis vel leviter retusis, 7 mm. longis; staminibus circiter 35, filamentis circiter 2 mm. longis, antheris filamenta subaequantibus, anguste oblongis.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, June, 1924, Canton Christian College no. 12590 (type) (Wulsin Expedition). A tree 40 feet high in forested ravines. The same species is manifestly represented by *R. C. Ching*, no. 2063 from Suan Ke, south of Ping Yung, Chekiang Province.

FLACOURTIACEAE

***Bennettiodendron*, nom. nov.**

(*Bennettia* Miquel, Fl. Ind. Bot. i. pt. 105 (1859); non R. Br., nec S. F. Gray)

***Bennettiodendron brevipes*, sp. nov.**

Arbor parva, circiter 6 m. alta, ramulis junioribus inflorescentiisque perspicue pubescentibus exceptis glabra, ramis teretibus, glabris; foliis chartaceis, oblongo-ob lanceolatis ad obovato-ob lanceolatis, utrinque subconcoloribus, nitidis, 5–12 cm. longis, 2–5 cm. latis, acuminatis, basi acutis, distanter glanduloso-serratis, dentibus brevibus, obtusis, nervis primariis utrinque 7–9, perspicuis; petiolis 3–13 mm. longis, pilosis vel dense pubescentibus; inflorescentiis terminalibus, ciliatis vel pubescentibus, 6–12 cm. longis, usque ad 4.5 cm. latis, multifloris, floribus in ramis

primariis racemoso-umbellatim dispositis; floribus femineis sepalis 3, elliptico-ovatis, obtusis, 3-3.5 mm. longis, obscure ciliatis, deciduis; staminodiis numerosis, circiter 1.2 mm. longis, filamentis ciliatis, glandulis numerosis, obovoideis, glabris, incrassatis, usque ad 0.5 mm. longis; ovario glabro, ovoideo, ovulis paucis (circiter 8), stylis 3 vel 4, patulis, 1-1.5 mm. longis; fructibus junioribus ovoideis, circiter 3.5 mm. longis.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, June, 1924, Canton Christian College, Nos. 12473 (type), 12623 (Wulsin Expedition). In forested ravines; local name "shan kwai fa." The same species is apparently represented by Rock, No. 2689 from southern Yunnan.

This species is characterized by its pubescent branchlets and inflorescences, short petioles, and numerous lateral nerves, as compared with the two closely allied species from southern Asia and western Malaysia currently known as *Bennettia leprosipes* Koord., and *B. longipes* Oliv. The genus is new to China.

I have proposed a new name for this genus to avoid confusion with the genera *Bennettia* R. Brown and *Bennettia* S. F. Gray, both much earlier than Miquel's use of the same name; Robert Brown's *Bennettia* is a synonym of *Galearia* of the Euphorbiaceae, and S. F. Gray's *Bennettia* is a synonym of *Saussurea* of the Compositae. The known species of *Bennettiodendron* are as follows:

***Bennettiodendron leprosipes* (Clos), comb. nov.**

Xylosma leprosipes Clos in Ann. Sci. Nat. Bot. sér. 4, VIII. 233 (1857).

Bennettia Horsfieldii Miquel, Fl. Ind. Bat. I. pt. II. 105 (1859).

Myroxylon leprosipes Kuntze, Rev. Gen. Pl. I. 44 (1891).

Bennettia leprosipes Koorders, Exkursionsfl. Java, II. 635 (1912); Koorders & Valetton, Atlas Baumart. Java, II. fig. 336, 337 (1914).

JAVA, SUMATRA.

***Bennettiodendron longipes* (Oliv.), comb. nov.**

Bennettia longipes Bennett in Hooker's Icon. XVI. t. 1596 (1887).

SILHET.

***Bennettiodendron papuanum* (Gilg), comb. nov.**

Bennettia papuana Gilg in Bot. Jahrb. LV. 283 (1918).

NEW GUINEA.

MELASTOMATACEAE

***Bredia* Blume**

***Bredia chinensis*, sp. nov.**

Frutex circiter 1 m. altus, ramosus, ramis teretibus, glabris, ramulis plus minusve patule hirsutis, junioribus circiter 1 m. diametro, furfuraceis et perspicue capitato-glandulosis, pilis capitatis tenuibus, patulis, usque ad 1.5 mm. longis; foliis oppositis, chartaceis, glabris vel junioribus parce furfuraceis, ovatis ad oblongo-ovatis, distanter serrulatis, olivaceis vel atro-viridibus, subtus pallide viridibus, laevibus, distincte acuminatis, basi rotundatis, perspicue 3- vel obscure 5-nerviis, haud 3- vel 5-plinerviis

3-7 cm. longis, 1.5-4.5 cm. latis, nervulis transversalibus tenuibus obscuris; petiolo 1-2.5 cm. longo; paniculis terminalibus pedunculatis, 4-8 cm. longis, furfuraceis et perspicue capitato-glandulosis; floribus roseis, 4-meris, pedicellatis, calycibus subcupulatis, circiter 4 mm. longis, parce furfuraceis et disperse capitato-glandulosis, lobis 4, late ovatis, haud 1 mm. longis; petalis 4, elliptico-ovatis ad late ovatis, breviter acuminatis, circiter 6 mm. longis, glabris; staminibus 8, inaequalibus, majoribus filamentis 8 mm. longis, antheris anguste lanceolatis, tenuiter acuminatis, curvatis, 8 mm. longis, basi antice obscure bicallosis, minoribus rectis, crassioribus, lanceolatis, 4 mm. longis, basi antice perspicue bicallosis, postice 1-callosis.

CHEKIANG PROVINCE: without definite locality, *H. H. Hu*, no. 30 (type), August, 1920, distributed as *Barthea chinensis* Hook. f.; Sze-ton, south of Siachu, *R. C. Ching*, no. 1684, May-June, 1924. FUKIEN PROVINCE, near the Chekiang border *R. C. Ching*, no. 2309, August, 1924.

In many respects this resembles *Bredia hirsuta* Blume of Japan and Formosa, differing in its smaller, glabrous not cordate, fewer nerved leaves, which are 3- or sometimes 5-nerved, not 3-7-nerved, as well as in its capitate-glandular hairs on the younger branchlets and inflorescences. In the latter character it more closely resembles the Formosan *Bredia scandens* Hayata but in other respects it is remote from that species.

***Bredia glabra*, sp. nov.**

Frutex glaber, circiter 1 m. altus, ramis ramulisque teretibus, ramulis 1-1.5 mm. diametro; foliis oppositis, chartaceis ad subcoriaceis, ovatis ad oblongo-ovatis, 4-9 cm. longis, 1.5-4.5 cm. latis, obscure distanter serrulatis ad integris, acutis vel leviter acuminatis, basi plerumque acutis, 3- vel obscurissime 5-nerviis, laevibus, supra olivaceis, subtus viridibus vel flavido-viridibus, nervis transversalibus venulisque obsolete vel obscuris, petiolo 4-20 mm. longo; inflorescentiis terminalibus, paucifloris, 2-4 cm. longis, breviter pedunculatis, junioribus interdum parvis obscure breviter stellato-pubescentibus; floribus plerumque 3, pedicellatis, roseis, 4-meris; calycibus cupulatis, circiter 6 mm. longis latisque, limbo plus minusve producto, truncato, extus breviter 4-callosis; petalis elliptico-ovatis, circiter 9 mm. longis, leviter acuminatis vel acutis; staminibus 8 inaequalibus, majoribus filamentis 9-10 mm. longis, antheris lanceolatis, acuminatis, curvatis, 1 cm. longis, connectivo leviter producto, antice brevissime 2-callosis, postice inappendiculato vel obscurissime 1-callosis, minoribus filamentis 6 mm. longis, antheris circiter 8 mm. longis, antice perspicue basi 2-callosis, postice 1-callosis.

CHEKIANG PROVINCE: Pinyung Hsien, on slopes, *Ling Kan*, no. 7333, July, 1924. The same species is represented by *R. C. Ching*, no. 2029 in the United States National Herbarium from the same locality,

July, 1924, growing on open wet grassy slopes at an altitude of about 1400 m.

In making the preliminary identifications both of these specimens were tentatively referred to *Barthea chinensis* Hook. f., which in superficial characters the present species closely resembles. An examination of the flowers however shows that *Bredia* is clearly the proper genus. It is distinguished by its being glabrous or nearly so, by its 3-nerved entire or obscurely toothed leaves, and by its few relatively large flowers.

Tashiroea Matsumura

Tashiroea sp.?

ANWHEI PROVINCE: Wu Yuan, *R. C. Ching*, no. 4579 (Nanking Univ. Herb. no. 8985), September, 1925. On open moist slopes at an altitude of about 600 m.

The specimen is in fruit, hence the generic identification is doubtful. It rather closely approximates *Tashiroea okinawensis* Mats. of the Liu Kiu Islands. The genus is known from two or three species in the Liu Kiu Islands and Formosa, but has not been previously recorded from China.

MYRSINACEAE

Ardisia Swartz

Ardisia pseudoverticillata, sp. nov. (§ *Acrardisia*).

Frutex erectus, ut videtur haud ramosus, circiter 1 m. altus, caulibus circiter 8 mm. diametro; foliis circiter 4, ad apicem pseudoverticillatim dispositis, petiolatis, oblongis, chartaceis, 15–20 cm. longis, 4.5–7 cm. latis glabris, utrinque perspicue glandulosis, glandulis paucis, elevatis, late dispersis, basi acutis, apice plus minusve acuminatis, margine dense apiculato-serratis dentibus patulis haud 1 mm. longis, supra in sicco subcastaneo-olivaceis, subtus pallide viridibus, nervis primariis utrinque 10–12, distantibus, subtus perspicuis, arcuato-anastomosantibus, reticulo venularum laxo; petiolo 1–1.5 cm. longo; inflorescentiis circiter 4, terminalibus, foliis aequantibus, puberulis, multifloris, floribus in ramis primariis racemose dispositis, ramis patulis, tenuibus, 2–4 cm. longis, bracteis foliaceis lanceolatis, perspicue glandulosis, 1–1.5 cm. longis, pedicellis 6–12 mm. longis; sepalis oblongo-ovatis, acutis ad leviter acuminatis, apertis, 1–1.2 mm. longis, in parte superiore parcissime glandulosis, margine breviter obscure ciliatis; petalis glabris, roseis, oblongo-ovatis, acutis, circiter 4 mm. longis, in parte superiore parce glandulosis; antheris ovoideis, obtusis, 1.7 mm. longis, connectivo haud glanduloso, filamentis brevissimis, crassis; ovario ovoideo, glabro, stylis contortis, usque ad 5 mm. longis, ante anthesin haud porrectis.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, July 4, 1924, Canton Christian College no. 12657 (Wulsin Expedition). In ravines; local name "tsau ma t'oi."

A very strongly characterized species apparently not closely allied to any previously described form. Its striking characters are its erect, apparently unbranched stems, the plant attaining a height of 1 m., the densely toothed and conspicuously but distantly glandular leaves being pseudovercicillately arranged at the apex of the stem. The terminal inflorescences, one to each leaf, are narrowly paniculate, many flowered, puberulent, and as long as the leaves, the flowers being racemosely disposed along the upper part of the primary branches.

Myrsine Linnaeus

The species recently described by me from Indo-China as *Embelia acuminata* certainly belongs in *Myrsine*, and is here transferred to that genus:

Myrsine integrifolia, nom. nov.

Embelia acuminata Merrill in Univ. Calif. Publ. Bot. XIII. 139 (1926).—Non *Myrsine acuminata* Royle.

INDO-CHINA: T o n k i n, Chapa, *Petelot*, nos. 1779, 1936.

Manifestly allied to the Chinese *Myrsine marginata* Mez, but with entire leaves, no marginal nerves, the lateral nerves obsolete or nearly obsolete beneath.

SYMPLOCACEAE

Symplocos Jacquin

Symplocos lungtauensis, sp. nov. (§ *Bobua*, *Lodhra*).

Frutex circiter 2 m. altus, ramis teretibus, glabris, ramulis circiter 2 mm. diametro, dense sordide villosis; foliis flavido-viridibus, nitidis, utrinque concoloribus, submembranaceis ad chartaceis, oblongis, 5–8 cm. longis, 2–3 cm. latis, basi acutis ad subrotundatis, apice tenuiter acute acuminatis, margine plerumque revolutis, integris vel sursum distanter argute serrulatis, supra ad costam et in parte inferiore disperse pubescentibus, subtus molliter villosis, nervis primariis utrinque 7–9, tenuibus, perspicuis, utrinque ut costa leviter elevatis, reticulo venularum laxo; petiolo villosa, 2–4 mm. longo; floribus axillaribus, solitariis, ut videtur flavidis, interdum solitariis, plerumque in spicis brevissimis (vix 3 mm. longis) dispositis, bracteolis late ovatis, pubescentibus, 1–1.4 mm. longis; calycibus plus minusve villosis, lobis orbiculari-ovatis, rotundatis, haud 1 mm. longis; petalis subliberis, membranaceis oblongis, glabris, 3–4 mm. longis; filamentis numerosis, glabris, basi brevissime connatis, 4–5 mm. longis; fructibus oblongo-ellipsoideis, disperse pubescentibus, 6–8 mm. longis, circiter 4 mm. diametro.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, in forests, North River region, May, 1924, Canton Christian College, no. 12066 (Wulsin Expedition).

A species well characterized by its pubescent leaves and branchlets, and its very short spicate inflorescences, or the flowers sometimes solitary

or even fascicled. The floral characters given in the diagnosis are from very old flowers. This seems clearly to fall in the group with *Symplocos anomala* Brand, but is not closely related to that species.

STYRACACEAE

Styrax Linnaeus

Styrax parviflorus, sp. nov. (§ *Eustyrax*, *Valvatae*).

Arbor parva, usque ad 7 m. alta, inflorescentiis floribusque minute cinereo-puberulis exceptis glabra, ramis ramulisque teretibus, glaberrimis; foliis coriaceis vel subcoriaceis, plerisque oblongo-ellipticis, integerrimis, utrinque subaequaliter angustatis, basi acutis, apice distincte acuminatis, in sicco utrinque concoloribus, nitidis, glaberrimis, 6–11 cm. longis, 2.5–4.5 cm. latis, nervis primariis utrinque 5–6, curvatis, subtus distinctis, obscure arcuato-anastomosantibus, reticulo venularum primariorum laxo; petiolo glabro, 7–9 mm. longo; inflorescentiis plerisque axillaribus, depauperato-paniculatis, usque ad 5 cm. longis, paucifloris, uniformiter dense cinereo-puberulis, pedicellis usque ad 5 mm. longis; floribus parvis, calycibus puberulis, cupulatis, breviter acute 5-dentatis, 2–2.5 mm. longis; petalis 5, subliberis, ut videtur valvatis, utrinque minute cinereo-puberulis, oblongis, obtusis, circiter 6 mm. longis et 2.3 mm. latis; staminibus 10, filamentis compressis, circiter 3 mm. longis, utrinque puberulis, antheris filamentis aequilongis glabris, anguste oblongis, connectivo pro rata lato, apice breviter 3-lobato, lobis minutis, acutis, medianis quam lateralibus multo minoribus; ovario 4-loculari, puberulo; stylis 7 mm. longis, puberulis, brevissime 3-lobatis; fructibus junioribus cernuis, ellipsoideis, cinereo-puberulis, circiter 5 mm. longis, apice distincte rostratis.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, on forested slopes, North River region, May and June, 1924, Canton Christian College nos. 12070 (type), 12349 (Wulsin Expedition). Color of the flowers indicated as purple.

A very strongly marked species characterized by its unusually small flowers and apparently small fruits which are distinctly cernuous, as well as by its entirely glabrous branchlets and leaves. The three minute terminal teeth on the connectives are unusual. The first specimen cited is just beyond the flowering stage, but one complete flower and fragments of others were found with it; the second specimen has immature fruits, being collected about two weeks later.

APOCYNACEAE

Pottsia Hooker & Arnott

Pottsia grandiflora Markgraf in Notizbl. Bot. Gard. Mus. Berlin, ix. 1029 (1926).¹

Frutex alte scandens, glaber, ramis ramulisque teretibus, subpurpureis, ramulis circiter 2 mm. diametro; foliis ovatis ad elliptico-ovatis, 7–9

¹ See note on p. 68.

cm. longis, 4–4.5 cm. latis, subcoriaceis, in sicco rigidis, supra pallide olivaceis vel olivaceo-brunneis, subtus pallidioribus, brunneis, utrinque glaberrimis, basi plerumque rotundatis, saepe leviter decurrentibus, apice perspicue obtuseque acuminatis, nervis primariis utrinque circiter 6, tenuibus, subtus cum venulis subcastaneis, perspicuis; petiolo 1–1.5 cm. longo; inflorescentiis terminalibus, pedunculatis, subdiffusis, multifloris, subdichotome ramosis, pedunculatis, circiter 15 cm. longis latisque, ramis ramulisque bracteis foliaceis oblongis 1–1.5 cm. longis suffultis; floribus rubris vel purpureis, pedicellis usque ad 1.3 cm. longis; calycis tubo subcupulato, circiter 2.5 mm. diametro, glabro, lobis late ovatis, acutis, 2–2.5 mm. longis, margine obscure ciliatis, intus ad basin squamulis multis instructis; corollae tubo cylindrico, circiter 6 mm. longo, 3 mm. diametro, extus glabro, lobis magnis, quam tubus longioribus, reflexis, inaequilateraliter obovatis, imbricatis, circiter 8 mm. longis; filamentis intus in parte inferiore ad tubum adherente pubescentibus, in parte libera glabris, 2 mm. longis; antheris oblongis, acuminatis, basi sagittatis, 3 mm. longis, omnino exsertis; disco glabro, ovoideo, 2 mm. longo, crasso, crenato; carpellis inclusis glabris, stylis 6 mm. longis, basi angustatis, sursum inflatis, inde attenuatis, distincte fusiformibus.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, June 3, 1924, Canton Christian College no. 12318 (Wulsin Expedition). In ravines, a vine about 12 m. long, flowers red and purple.—Mr. Rehder states that Hongkong herb. no. 2912 collected by S. T. Dunn in Fukien province apparently represents the same species.

A species manifestly belonging in *Pottsia*, but radically different from *P. laxiflora* (Blume) Ktze. in its floral characters, the flowers being much larger, the calyx lobes equalling the broadly cupshaped tube, while the large corolla lobes, which are reflexed in anthesis exceed the corolla tube in length. The scales forming the disk are united for at least two-thirds their length, this being the only character I have detected in which the present species differs from *Pottsia* as described, in the type species of the genus the disk glands or scales being nearly free.

VERBENACEAE

Callicarpa Linnaeus

Callicarpa Lingii, sp. nov.

Frutex glaber vel subglaber, ramis pallidis, teretibus, glabris, ramulis circiter 2 mm. diametro, teretibus, minute stellato-puberulis, internodiis usque ad 9 cm. longis; foliis chartaceis vel submembranaceis, utrinque glabris vel junioribus supra obscurissime puberulis, brevissime petiolatis vel subsessilibus, oblongis, 15–22 cm. longis, 5–6.5 cm. latis, supra olivaceo-viridibus, subtus paullo pallidioribus, disperse aureo-glandulosis, apice distincte acuminatis, deorsum angustatis, basi circiter 7 mm. latis, abrupte obtusis, margine remote minuteque calloso-denticulatis, nervis primariis utrinque 10–12, distantibus, curvatis, distinctis, laxe arcuato-

anastomosantibus, reticulo venularum laxo; petiolo vix 1 mm. longo, parce stellato-puberulo; infructescentiis solitariis supra-axillaribus, cymosis, circiter 2.5 cm. longis, minute decidue stellato-puberulis, vix pedunculatis, paullo supra basin ramosis, ramulis pedicellisque brevibus glabris vel subglabris, bracteis lineari-lanceolatis, 1-2 mm. longis; calycibus sub fructu glabris, circiter 3 mm. diametro, leviter undulato-crenatis; fructibus late ovoideis vel subobovoideis, glabris, circiter 3 mm. longis.

ANHWEI PROVINCE: Wu Yuen, in forests, *K. Ling*, no. 7851, August 23, 1924.

The alliance of this species is manifestly with *Callicarpa brevipes* Hance from which it is at once distinguished by being nearly glabrous except for the branchlets and the inflorescences, as well as by its much longer glabrous leaves.

RUBIACEAE

Hedyotis Linnaeus

Hedyotis Wulsinii, sp. nov. (§ *Dimetia*).

Suffruticosa, ut videtur scandens, caulibus viridibus, circiter 4 mm. diametro, distincte 4-angulatis, glabris, laevibus, initio parce pubescentibus, internodiis 8-15 cm. longis, ramis circiter 2 mm. diametro, acute 4-angulatis; foliis oppositis, lanceolatis ad oblongo-lanceolatis, 6-12 cm. longis, 1.5-3 cm. latis, supra viridibus, subtus paullo pallidioribus, utrinque minute scaberulis et distincte disperse pubescentibus pilis brevibus pallidis, tenuiter acute acuminatis vel acutis, basi acutis ad decurrente-acuminatis, nervis primariis utrinque 3 vel 4, adscendentibus, supra obscuris, subtus valde perspicuis, elevatis, reticulo venularum obscuro vel obsoleto; petiolo 2-8 mm. longo; stipulis ovatis, laciniato-lobatis, lobis usque ad 10, interioribus usque ad 3 mm. longis, angustis, exterioribus gradatim brevioribus; inflorescentiis axillaribus terminalibusque, paniculatis, diffusis, pedunculatis, 15-30 cm. longis, disperse subhirsutis, cymulis laxis; floribus numerosis, albidis ad subpurpureis, 4-meris, perspicue subhirsutis, calycibus dense hirsutis, tubo ovoideo, lobis oblongis, acutis ad obtusis, viridibus; corollae tubo glabro, 1.5 mm. longo, lobis lanceolatis, acuminatis, circiter 6 mm. longis, 1.2 mm. latis, acutis vel acuminatis, intus dense longe villosis, extus breviter disperse hirsutis; stylis glabris, 6 mm. longis; filamentis glabris, 2.5-3 mm. longis, quam antherae duplo longioribus; pedicellis 3-10 mm. longis, bracteis parvis, oblongis, circiter 1 mm. longis.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, on slopes, June, 1924, Canton Christian College nos. 12023 (type), 12206 (Wulsin Expedition). Local name "tsak u t'am."

A species clearly belonging in the group with *Hedyotis capitellata* Wall. and *H. macrostemon* Hook. & Arn., differing radically in its laxly disposed flowers, the pedicels varying from 3-10 mm. in length. The

indumentum is characteristic, particularly that of the corolla lobes, these being densely long pilose on the inside and with short, scattered, rather stiff hairs on the outside.

Hedyotis longipetala, sp. nov. (§ *Diplophragma*).

Suffrutex erectus, ramosus, glaberrimus, 30–40 cm. altus, caulibus rigidis, teretibus, griseis, 4–6 mm. diametro, ramis numerosis, adscendentibus, vetustioribus 2–3 mm. diametro, teretibus ad subangulatis, internodiis plerumque brevibus, junioribus viridibus, acute 4-angulatis ad anguste 4-alatis; foliis crasse coriaceis, rigidis, lanceolatis ad lineari-lanceolatis, 3–7 cm. longis, 4–12 mm. latis, tenuiter acuminatis, basi cuneatis, margine revolutis, in sicco flavido-viridibus, subtus pallidioribus, rugosis, nervis primariis utrinque 2 vel 3, subtus obsoletis, supra impressis, adscendentibus, saepe obsoletis, reticulo venularum utrinque obsoleto; petiolo 4–8 mm. longo; stipulis 4–5 mm. longis, rigidis, coriaceis, integris, ovatis ad oblongo-ovatis, acuminatis; inflorescentiis axillaribus terminalibusque, floribus axillaribus solitariis ad depauperato-fasciculatis, terminalibus dense subcapitatim dispositis, capitulis (sub fructu) 1.5–2 cm. diametro; floribus ut videtur albidis, 4-meris, pro ratione magnis, subsessilibus vel breviter pedicellatis; corollae tubo cylindrico, glabro, 3.5 mm. longo, lobis lanceolatis, circiter 11 mm. longis, 1.5 mm. latis, extus glabris, intus plus minusve pubescentibus; filamentis glabris, 1 cm. longis, antheris circiter 2 mm. longis; calycibus coriaceis, glaberrimis, tubo ovoideo, supra capsulis longe (circiter 3 mm.) producto, lobis coriaceis, levibus, nitidis, erectis, lanceolatis, acuminatis, circiter 4 mm. longis; capsulis ovoideis ad ellipsoideis, circiter 4 mm. longis.

KWANGTUNG PROVINCE: Shiu Chau (Fu Gung Mountain), and Lung T'au Mountain, near Iu, on mountain top in forest, North River region, June and July, 1924, Canton Christian College nos. 13010 (type), 12419 (Wulsin Expedition). Local name "t'in heung lo."

A very strongly characterized undershrub, recognizable by its habit, being erect, rigid, much branched, with terete stems and sharply 4-angled or narrowly 4-winged branchlets, short internodes, and rigid, coriaceous, practically nerveless leaves, as well as by its fruit and flower characters, the flowers being axillary and terminal, the terminal ones being crowded in subglobose rather compact heads 1.5–2 cm. in diameter. The plant is entirely smooth and glabrous except for the somewhat pubescent inner surface of the petals. The corolla characters were taken from dried and much shrivelled flowers. Specimens sent to Kew were reported by Mr. S. T. Dunn as *Hedyotis* sp. near *H. Lessertiana* Arn. = *Oldenlandia arenaria* Haines.

Lasianthus Jack

Lasianthus caudatifolius, sp. nov. (§ *Pedunculatae*).

Frutex circiter 2 m. altus ramulis et petiolis et foliis supra ad costam et subtus ad costam nervosque disperse ciliatis, ramulis teretibus,

inflorescentiis breviter pedunculatis; ramulis ultimis elongatis, junioribus interdum obscure compressis, tenuibus, 1-2 mm. diametro, olivaceis vel brunneo-olivaceis; foliis lanceolatis ad oblongo-lanceolatis, tenuiter caudato-acuminatis, basi acutis, 8-13 cm. longis, 2-3.5 cm. latis, olivaceis, nitidis, chartaceis ad subcoriaceis, supra costa excepta glaberrimis nervis primariis utrinque 5 vel 6, distinctis, curvato-adscendentibus, arcuato-anastomosantibus, plerumque dense ciliato-hirsuto; petiolo 4-6 mm. longo; stipulis dense pilosis, caducis; infructescentiis axillaribus, solitariis, distincte sed breviter (2-3 mm.) pedunculatis, petiolo brevioribus, ramis binis, brevissimis, crassis, parce pilosis; floribus ignotis; bracteis ut videtur minutis, deciduis; fructibus globosis vel ovoideis, glabris, circiter 5 mm. diametro, seminibus 5.

KWANGTUNG PROVINCE: Lung T'au Mountain, near Iu, North River region, in ravines, July, 1924, Canton Christian College no. 12692 (Wulsin Expedition). Local name "shan u ts'iu." The same species is apparently represented by Levine & McClure's no. 6915 from Wa Shui Tai.

The alliance of this species with slenderly caudate-acuminate leaves is manifestly with *Lasianthus foetidissimus* A. Chev. and *L. Balansae* Pitard of Indo-China, but the former is entirely glabrous except for the finely pubescent stipules and flowers, while the latter has membranaceous leaves and subquadrangular branchlets which are glabrous except at the hispid nodes; the indumentum in the present species is ciliate rather than hispid. In common with both of the above species this Chinese form has distinctly but shortly peduncled cymes. Its probable ally among the Chinese species is *Lasianthus Fordii* Hance but unfortunately the inflorescence or infructescence of the latter is not described although the presumption is, that the flowers are in sessile fascicles. Hance's species is, according to Hemsley, almost entirely glabrous. The original description of *Lasianthus Fordii* Hance, included also *Lasianthus trichophlebius* Hemsl., the latter as described by Hemsley, being very different from *L. caudatifolius* Merr.

NEW SPECIES AND NEW COMBINATIONS OF CHINESE PLANTS

WOON YOUNG CHUN

Ostrya Rehderiana Chun, sp. nov.

Ab *Ostrya japonica* Sarg. differt inflorescentiis laxis spiciformibus, non strobiliformibus, involucrio basi contracto, nuculis pubescentibus et foliis angustioribus.

Arbor ad 18 m. alta, trunco stricto, 45 cm. diam. (fide Ching), ramis horizontaliter patentibus; cortex intense brunneo-cinereus, asperatus; rami cinerei; ramuli graciles, brunnei, lenticellati, initio sericeo-pu-

bescentes, demum glabri et intense purpurascens; gemmae cylindrico-ovoideae, lucide virides, acutae, perulis pubescentibus. Folia elliptico-oblonga, 4-10 cm. longa et 3-4 cm. lata, caudato-acuminata, basi cuneata vel rotundata, simpliciter et irregulariter serrata vel obscure duplicato-serrata, supra viridia et parte inferiore costae excepta glabra, subtus pallide viridia, sparse pubescentes. Amenta mascula ad 2 cm. longa, 1-4 fasciculata in apice ramuli brevis subterminalis; bracteis striatis sericeo-pubescentibus praesertim ad marginem, cuspidato-acuminatis. Fructus satis distantes in spica laxa pendula 5-8 cm. longa pedunculo 2-3 cm. longo sericeo-pubescente suffulta; involucrum maturitate brunneum, elliptico-oblongum, 2-2.5 cm. longum et 8 mm. latum, apice rotundatum et apiculatum, basi in stipitem contractum, ad venas minute pubescens; nucula compressa, 8-10 mm. longa, calycis basi sericeo coronata, brunneo-virescens.

WESTERN CHEKIANG: Tien Moh Shan, alt. 400 m. fairly common in open woods, *R. C. Ching*, no. 3385, October 2, 1925 (National South-eastern University Expedition to Anhwei).—Specimens in the herbarium of the National Southeastern University, Nanking, China, and in the herbarium of the Arnold Arboretum.

This species is dedicated to Mr. Alfred Rehder.

***Cercis Chingii*, Chun, sp. nov.**

Ab omnibus speciebus generis facile distinguitur legumine exalato valvis crasse coriaceis seminibus paucis magnis in pulpa fungosa immersis instructo.

Frutex dumosus, ad 6 m. altus; cortex trunci cinereus, laevis; ramuli cinerascens vel brunneo-purpurascens, dense minuteque lenticellati, demum obscure cinerei. Folia coriacea, valde variabilia, ovata vel orbicularia ad reniformia, obtuse acuminata, basi late cuneata, rotundata vel cordata, rarius truncata, 5-11 cm. longa et 4-8 cm. lata, supra pallide viridia, subtus glauca et ad venas leviter pubescentia, utrinque minute reticulata; petioli 2-4 cm. longi, apice dilatati. Flores non visi. Fructus in ramis biennibus vel vetustioribus, solitarii vel bini pedunculis strictis circiter 1.8 cm. longis suffulti; legumen loriforme vel anguste oblongum, cuspidato-acuminatum cuspidate 3 mm. longa, crasse coriaceum, margine 2 mm. crassum, maturitate valvis patentibus, pallide luteum, margine linea brunnea notatum, non alatum, 3-6-spermum; semina compressa, lucida, fusco-nigra, 4-5 mm. diam., circiter 2 cm. crassa, in pulpa fungosa immersa.

SOUTHERN ANHWEI: 15 li east of Kweichow City, fairly common gregarious shrub along roadside in open, *R. C. Ching*, no. 3332, September 10, 1925 (National Southeastern University Expedition to Anhwei).—Specimens in the herbarium of the National Southeastern University, Nanking, China, in the herbarium of the Arnold Arboretum and in the U. S. National Herbarium.

This species is named in compliment to Mr. R. C. Ching, Botanical Collector and Instructor in the National Southeastern University.

Castanopsis Carlesii (Hemsley) Chun, comb. nov.

Quercus Carlesii Hemsley in Hooker's Icon. xxvi. t. 2591 (1899).

FOKJEN.

Lithocarpus Fordiana (Hemsley) Chun, comb. nov.

Quercus Fordiana Hemsley in Hooker's Icon. xxvii, t. 2664 (1900).

YUNNAN.

Lithocarpus hainanensis (Merrill) Chun, comb. nov.

Quercus hainanensis Merrill in Philip. Jour. Sci. xxiii. 239 (1923).

HAINAN.

Vanieria crenata (C. H. Wright) Chun, comb. nov.

Cudrania crenata C. H. Wright in Jour. Linn. Soc. xxvi. 469 (1899).

KWANGTUNG.

Vanieria fruticosa (Wight) Chun, comb. nov.

Cudrania fruticosa Wight apud Kurz, For. Fl. Brit. Burma, II. 434 (1877).

YUNNAN.

Vanieria pubescens (Trécul) Chun, comb. nov.

Cudrania pubescens Trécul in Ann. Sci. Nat. sér 3, VIII. 123 (1847).

YUNNAN.

Vanieria Bodinieri (Léveillé) Chun, comb. nov.

Cudrania Bodinieri Léveillé in Rep. Spec. Nov. Reg. Veg. XIII. 265 (1914).

KWANGTUNG, HAINAN.

Phoebe Faberi (Hemsley) Chun, comb. nov.

Machilus Faberi Hemsley in Jour. Linn. Soc. xxvi. 375 (1891).

HUPEH, SZECHUAN.

Notaphoebe omeiensis (Gamble) Chun, comb. nov.

Alseodaphne omeiensis Gamble in Sargent, Pl. Wilson. II. 70 (1914).

SZECHUAN: Omei shan and elsewhere.

In Sargent, Pl. Wilson. II. 70 (1914) Gamble doubtfully referred this species to *Alseodaphne* noting that the plant has the appearance of a *Phoebe*, near *P. lanceolata* Nees, but the unequalled and thickened calyx lobes of the flower and the unequal and thickened perianth and pedicels of the fruit clearly point to *Notaphoebe*.

Benzoin subcaudatum (Merrill) Chun, comb. nov.

Neolitsea subcaudata Merrill in Philip. Jour. Sci. Bot. XIII. 137 (1918).

Lindera subcaudata Merrill, l. c. xv. 237 (1919).

HAINAN.

Benzoin Laureola (Collett & Hemsley) Chun, comb. nov.

Lindera Laureola Collett & Hemsley in Jour. Linn. Soc. xxviii. 119 (1890).

INDIA, YUNNAN, KWANGTUNG, HAINAN.

Actinodaphne honkongensis Chun, nom. nov.

Actinodaphne angustifolia Benthām in Fl. Hongk. 293 (1861)—*Non* Nees in Syst. Laur. 600 (1836).

HONGKONG.

Differs from the Indian species for which it was mistaken in the smaller, oblong-lanceolate not glaucous leaves and in the flattened disk-shaped perianth of the fruit.

Neolitsea Playfairi (Hemsley) Chun, comb. nov.

Litsea? *Playfairi* Hemsley in Jour. Linn. Soc. xxvi. 384 (1891).

KWANGTUNG, HANAIN.

Allied to *N. pulchella* (Meissner) Merrill from which it may be distinguished by the much slenderer and smaller leaves and by being glabrous in all parts except the inflorescence.

Neolitsea chinensis (Gamble) Chun, comb. nov.

Neolitsea lanuginosa var. *chinensis* Gamble in Sargent, Pl. Wilson. II. 79 (1914).

SZETCHUAN, HUPEH.

Amplly distinct from the Indian species in the glabrescent, oblanceolate, not elliptic leaves which are not green but decidedly glaucous on the under surface.

Paulownia tomentosa (Thunberg) Steudel, Nomencl. Bot. II. 278 (1841).

Bignonia tomentosa Thunberg, Fl. Jap. 252 (1784).

Paulownia imperialis Siebold & Zuccarini, Fl. Jap. I. 25, t. 10 (1835).

The combination of Thunberg's older name under *Bignonia* was made by Steudel but was ascribed to Koch in Sargent, Pl. Wilson. I. 574 (1913) and in Chun, Chinese Econ. Trees, 288 (1922).

Serissa serissoides Druce in Rep. Bot. Exch. Cl. Brit. Isles, 1916, 646 (1917).

Democritea serissoides De Candolle, Prodr. IV. 540 (1830).

Leptodermis nervosa Hutchinson in Sargent, Pl. Wilson. III. 404 (1916).

PSEUDOCYTISUS AND VELLA

ALFRED REHDER

As pointed out already by M. L. Green and T. A. Sprague¹ the type species of the genus *Vella* is *Vella annua* L. Linnaeus proposed this genus in 1737 in his *Hortus Cliffortianus* (p. 329) basing it on *Nasturtium sylvestre Valentinum* of Clusius who published a good figure of the plant,² and citing also Morison's figure.³ The first generic description appeared in 1742 in Linnaeus, *Genera plantarum* (ed. 2, p. 317). In 1753 in his *Species plantarum* (p. 641), he added to the original species, which he named *Vella annua*, a second species, *V. Pseudocytisus*, and in consequence omitted in

¹ In Kew Bull. Misc. Inform. 1925, p. 51 and 1926, p. 99.

² Clusius, Rar. Pl. Hist. 129, fig. on p. 130 (1601).

³ Morison, Pl. Hist. Univ. II. 301, sect. 3, t. 19, fig. 8 (1680).

the 5th edition of his *Genera plantarum*, published in 1754, from the description of the pod of *Vella* the word "pendula" since in *V. Pseudocytisus* the pod is upright and not pendulous, but he did not change the words "dissepimento silicula duplo majore," though the flattened leafy style, which Linnaeus considered an outside extension of the dissepiment, is much shorter in *V. Pseudocytisus* than in *V. annua*. When in 1821 De Candolle¹ separated generically the two Linnaean species of *Vella*, he unfortunately referred the type species to the genus *Carrichtera* proposed by Adanson² and left *V. Pseudocytisus* under *Vella*. This disposition has been accepted by all later botanists, until in 1904 O. Kuntze pointed out³ that the type of *Vella* was *V. annua* and proposed the name *Pseudocytisus* for *V. Pseudocytisus* and related species.

There can be no doubt that Kuntze is right in this respect, and as the species have not yet been transferred to *Pseudocytisus*, I propose the following new combinations:

***Pseudocytisus integrifolius*, comb. nov.**

Vella Pseudocytisus Linnaeus, Spec. 641 (1753).

Vella integrifolia Salisbury, Prodr. 265 (1796).

SPAIN.

Though Salisbury's specific name is a *nomen abortivum* and does not indicate any difference from the other species of *Pseudocytisus* which all have entire leaves, having been given by Salisbury in contradistinction to *V. annua*, I have thought it more in keeping with general usage to conserve it, as one is allowed to do according to art. 56 of the International Rules, instead of proposing a new and perhaps more fitting name.

***Pseudocytisus spinosus*, comb. nov.**

Vella spinosa Boissier, Elench. Pl. Nov. 14 (1838).

SPAIN.

***Pseudocytisus glabrescens*, comb. nov.**

Vella glabrescens Cosson, Ill. Fl. Atl. i. 71, t. 48 (1884); Comp. Fl. Atl. ii. 277 (1887).

ALGERIA.

Pseudocytisus integrifolius and *P. spinosus* are occasionally cultivated in botanic gardens. The former was according to Miller⁴ and Aiton⁵ cultivated about 1759 in England but of the latter I have no knowledge of its being in cultivation until 1893, when I saw and collected it in the Botanic Garden at Goettingen where it had been received from the Botanic Garden at Innsbruck. These shrubs demand a sunny position in the rock garden and form dense bushes covered from the middle of May to the

¹ Syst. Pl. ii. 639, 641.

² Fam. Pl. 421 (1763).

³ in Post & Kuntze, Lexic. 464.

⁴ Gard. Dict. ed. 7 (1759).

⁵ Hort. Kew. ii. 370 (1789).

beginning of June with yellow flowers, as photographs of handsome plants in the Botanic Garden at Darmstadt published by J. A. Purpus show.¹

Vella Linnaeus

Vella Linnaeus Hort. Cliff. 329 (1737); Gen. Pl. ed. 2, 317 (1742); ed. 5, 289 (1754), pro parte.

Carrichtera Adanson, Fam. Pl. 421 (1763), pro parte.—De Candolle, Syst. II. 641 (1821).

Vella annua Linnaeus, Spec. 641 (1753).

Carrichtera Vellae De Candolle, Syst. II. 642 (1821).

Carrichtera annua Prantl in Engler & Prantl, Nat. Pflanzenfam. III. abt. 2, 173 (1891).

MEDITERRANEAN REGION.

ON NUTTALL'S TRAIL THROUGH ARKANSAS

ERNEST J. PALMER

We in America are passing through what might be termed an era of commemorative anniversaries: Centennials, sesqui-centennials, semi-centennials and tercentenaries of historical events and of personages more or less renowned in the annals of statesmanship, war, art, literature or science are following each other in bewildering array and are finding concrete expression in efforts ranging in ambition from world expositions, pageants and commemorative postage stamps, to the unveiling of busts, the partaking of banquets and the launching and reviewing of fleets of laudatory oratory and scripture by individual or grouped admirers and disciples.

It is in part the object of this paper to enter a modest skiff amongst these more pretentious craft by calling a rather tardy attention to the centenary of an event of no slight importance in the early scientific exploration of a part of the country in which I have of late been interested, an event which in view of the time and circumstances, must be ranked amongst the most courageous enterprises of its kind in the early nineteenth century, and which certainly seems to be deserving at this time of at least a passing tribute of praise.

It is now a little more than one hundred years since Thomas Nuttall, the English naturalist, set out from Philadelphia on his remarkable scientific pilgrimage to visit the then little known Territory of Arkansas. Traveling by stage to Lancaster, he proceeded thence on foot to Pittsburgh, a distance of 280 miles as now reckoned by rail, where, having purchased a light skiff and supplies, he embarked on October 21st, 1818, on the Ohio River and began his voyage down that stream and the Mississippi to the junction of the Arkansas and White Rivers with the Mississippi. From there, subsequently, he worked his way laboriously

¹ in Gartenfl. LXXV. 436, 437 (1926).

up the Arkansas River, and after encountering many dangers and difficulties, arrived early in the spring of 1819 at the frontier military post of Belle Point, later called Fort Smith, and the site of the present flourishing city of that name. After spending some time at the garrison, exploring the surrounding country and making several extensive excursions into what is now the state of Oklahoma, he proceeded by river to New Orleans and thence returned to his starting point, which he reached after an absence of nearly a year and a half.

The record of his travels published in Philadelphia in 1821: "A Journal of travels into the Arkansa Territory during the year 1819," being the earliest account written by a competent observer of that part of the country, is not only a work of considerable scientific and historical value, but is one that can scarcely fail to interest any intelligent reader, as a simple narrative of adventure and a faithful picture of pioneer life and conditions amongst the early white settlers.

On the scientific side the author records his observations on the geography and geology of the country through which he passed, with notes on the customs, traditions and prehistoric remains of the various Indian tribes, and more particularly accounts of the plants, birds and other forms of wild life which he encountered. His investigation of the flora of the region, which was the primary object of the journey, led to the discovery of many plants previously unknown to scientists, and his subsequently published descriptions of these and others collected in various parts of the country deservedly secured for him an honorable recognition in the scientific world, and have made his name familiar to all students of American botany.

We who today pass over the route followed by Nuttall accomplishing the distance in a few hours with the comparative comforts of modern travel, and view from the windows of the speeding train great industrial cities and highly cultivated farm lands bordering the majestic rivers, can scarcely appreciate the magnitude and difficulties of such a journey a century ago. And while changes have been less marked and conditions still remain comparatively primitive in some of the more remote sections penetrated by him, yet even there the dangers and inconveniences of travel have been largely overcome, and accommodations at which the modern traveler might be prone to cavil would have been considered almost luxurious at that early day. The great rivers were then the only highways of commerce, and travel upon them was slow and uncertain. Steamboats were beginning to ply on the lower Ohio and Mississippi rivers, and farther up when the stage of water permitted, and in their downward course traders, trappers and many emigrants with their merchandise, household possessions and stock, bound for the new lands to the west and south, floated slowly with the current on a motley fleet of rafts, flat-boats, skiffs and arks, several of the smaller craft often lashed together for greater safety and to secure a wider sweep of the

current. Such traffic as went up stream made laborious headway against currents and such other obstacles as shallows, sand bars and the sunken rocks and logs that often obstructed the channels.

Back from the rivers and larger towns and in the more recently settled districts, there were no stage lines, bridges nor roads beyond mere trails through the forests and prairies, no places of public entertainment nor facilities for securing anything but the most primitive accommodations or supplies. The houses of the settlers, for the most part one and two roomed cabins, often domiciling large families which were then in vogue, were frequently miles apart.

The Territory of Arkansas had but recently been organized; settlements were few and mostly confined to the borders of the navigable rivers, many of the sites being malarious and surrounded by swamps. Indians of various tribes, most of them more or less hostile or restless, formed a large part of the population of the territory. These, and the wild animals that abounded were, however, often less dangerous than the renegado whites, who as fugitives from justice or outcasts from the restraints of more settled society sought in the wilderness a wider field for their lawless depredations. Title to much of the land was in dispute, both on account of Indian claims and those based upon earlier grants by the French and Spanish governments. This circumstance, in addition to the natural difficulties of pioneer enterprise in a section remote from travel and civilization, naturally tended to retard settlement and to render living conditions most precarious and primitive.

It was under these conditions, into this untamed wilderness and nascent society, that Thomas Nuttall set out without companion or guide, with meager equipment and resources, and armed only with a few letters of introduction from friends in Philadelphia to citizens and military authorities in the new territory.

The account of this journey that Nuttall has left us is, as its title implies, in the form of a journal or notes written from day to day. It has the merit, as the author modestly and somewhat apologetically explains in the preface, of being free from the literary embellishments often affected by the writers of the time, and he also assures us that in publishing it he has no intention of appealing to the fastidious tastes of the casual or merely curious reader. But although the writer was concerned chiefly with the scientific aspect of the country through which he passed, he by no means confined himself to such matters, and the narrative abounds in incidents and observations of the most varied character, and is not devoid of colorful passages and human interest. Interspersed with his account of daily happenings and descriptions of the country and its natural history and of the ethnology, folklore and antiquities of the Indians, are observations and comments on subjects ranging from the cost of commodities, and the quality and value of crops, cattle and farm lands, to incidents portraying pioneer life and Indian traits. Sometimes

also the author is led into poetic flights, inspired by the beauties of nature as revealed in the changing landscape or the unfolding season, or into philosophic digressions on the frailties of human nature, called forth by the avarice or sordidness of people he encounters or by the general ignorance and thriftlessness of portions of the population. Some of the author's remarks are shrewd and amusing, and at times there is a touch of pathos as we sense the scarcely concealed distress that his sensitive nature must have experienced in its contact with the rough world of men with which he was by temperament so little fitted to cope.

Rare courage and devotion to science were surely needed to induce such a man to undertake and carry out a journey like that he records. On one occasion he relates how he was imposed upon by boatmen who pretending to free his stranded boat, left it in the dark upon the other end of the mud bar in order to extort a further charge. Later, having sold his boat upon entering the Arkansas River, he made application to some land speculators who were going up the river, for a passage with them, only to be refused except on the condition that he should furnish his own supplies and work as a common laborer. He comments rather bitterly and justly on their ignorance and lack of appreciation of scientific effort. On several occasions he complains that men whom he had hired or given passage refused, through insolence or indolence, to perform their duties, and he was compelled to wait their drunken whims or himself plunge into the icy water to guide or propel the boat, and once to watch under arms all night to prevent its being stolen by a rascally employee. At another time his horse was seized by a vagrant Osage Indian, and on the advice of a trader companion familiar with the revengeful character of the marauder, he was constrained to make the culprit a present in order to recover his property instead of meeting out deserved punishment. On various occasions he deplores the drunken and dissolute character of the companions with whom he was compelled to travel or lodge, and once he mentions his mortification at the ostracism he encountered because of his refusal to take part in the drinking and gambling excesses of his host and fellow guests at a frontier tavern.

After entering the Arkansas River he experienced great difficulty in getting his boat up to the settlement at Arkansas Post. He tells us how this was effected with the aid of two French boatmen and a Negro whom he had hired. Compelled himself at times to wade waist deep in the water and sinking into the mud at every step in order to avoid capsizing the boat, he thus comments on the incident: "In the meanest garb of a working boatman and unattended by a single slave I was no doubt considered, as I had probably been by the land speculators, one of the canaille; my thoughts centered upon other objects, and all pride of appearance I willingly sacrificed to promote with frugality and industry the object of my mission."

But if the conditions and incidents of travel were often trying, he found,

as he frequently indicates, full compensation in contemplating the beauties of nature and in the fruitful pursuit of science. In describing the passage up the Arkansas and the country subsequently explored, the dominant note is one of enthusiastic delight; and the varying landscape, the bold facades of bluff and mountain, the majestic sweeps of the river, the gloom and silence of the primeval forest or the morning chorus of the birds and the multi-colored floral covering of the vernal prairies sometimes inspire him to passages of poetic fervor. He thus describes the prairies of the Cretaceous limestone areas bordering Red River, which he saw for the first time while accompanying a military party from the garrison at Fort Smith:

"These vast plains, beautiful almost as the fancied Elysium, were now enamelled with innumerable flowers, amongst the most splendid of which were the azure Larkspur, gilded Coreopsides, Rudbeckias, fragrant Phloxes and purple Psilotria; serene and charming as the blissful regions of fancy, nothing here appears to exist but what contributes to harmony." In striking contrast was the impression made upon him, which he earlier records, by the dense forests of the extensive flood plains near the mouth of the Arkansas and along the Mississippi River:

"How many ages," he is moved to exclaim, "must elapse before these luxuriant wilds of the Mississippi can enumerate a population equal to the Tartarian desert! At present all is irksome silence and gloomy solitude, such as to inspire the mind with horror." In this forecast, he was of course misled, like many of his contemporaries, through lack of prevision of the changes destined to be wrought through modern transportation.

As a historical document the Journal of Nuttall is of considerable value on account of its accurate descriptions of many of the early settlements, and notes on the economic development of the territory and the social conditions prevailing amongst the pioneers and the native tribes with whom they were in contact. Pittsburgh was already a bustling industrial city; Wheeling he describes as "consisting of a tolerably compact street of brick houses, with the usual accompaniment of stores, taverns and mechanics." At Cincinnati, which he considers to be "by far the most agreeable and flourishing of all the western towns," he mentions the fact that a medical college was about to be opened, but he regards such enterprises as rather premature. In his descent of the Ohio and Mississippi rivers we get glimpses of settlers' cabins and clearings and occasional settlements and towns, some of which have since grown to importance while others have disappeared or have assumed other names. Louisville is described as a flourishing town, in spite of the depreciated Kentucky bank-note currency, of which he says: "A more ruinous and fraudulent system of exchange was never devised in any Christian country." Troy, Ohio, he designates as "a miserable handful of cabins dignified by this venerable name," Owensville, (Owensborough,

Kentucky) "another insignificant cluster of log cabins, and the seat of a county," Shawneetown, "a handfull of log cabins with some of them shingled." He also refers incidentally to passing a small town called Evansville; and New Madrid is "an insignificant French hamlet of little more than twenty log houses and stores, miserably supplied." After passing Marietta, Ohio, he remarks: "We scarcely, indeed, see anything in this quarter but the miserable log cabins of tenants so poor and ill provided even with the common necessities of life, that had we not taken the precaution of providing ourselves with provisions, we must often have had to fast or sit down to nothing better than mush and milk." In commenting on the extortionate charges demanded from travelers at one settlement on the Mississippi, he introduces a list of prices, which includes such items as lead for bullets eighteen cents per pound, butter thirty-seven and a half cents, pork six dollars per hundred, beef five, and whisky one dollar and a quarter per gallon. Needless to say, this was in a day when the last-named article was a commodity and not a political issue.

Such settlements as existed in the new territory of Arkansas were mostly along the banks of the river. Arkansas Post, the territorial capital and chief commercial center, had been established at an early period in the history of the country by French trappers and traders. After a century of existence, Nuttall tells us, it contained at the time of his visit between twenty and thirty houses and three stores, and was destitute of even a hatter, a shoe-maker or a tailor. A few families were settled on both sides of the river at the "Little Rock" so called from an outcrop of stratified silicious rock, the first encountered in ascending the river. There was as yet, however, no town at the site of the present state capital and nothing to indicate its destined importance as a commercial and political metropolis. Amongst other embryonic settlements mentioned are those at the Cadron, Dardanelle, and one at the mouth of Pecan Creek. But most of these were merely projected towns, consisting of only a few houses grouped together for mutual protection and convenience, in addition to the ambitious projects of town agents and land speculators.

Nuttall, however, while noting and recording all of these facts and impressions on various subjects, which add interest to his Journal, never for long loses sight of the real object of his enterprise, which was the study of the ethnology of the various Indian tribes, and of the geology, fauna and flora of the Arkansas Territory. And it is of course with the last subject that we are chiefly concerned in this paper.

As it has been my fortune to travel at various times over most of the route first blazed to science by this early naturalist, I have followed the account of his journey and the description of the country as he then saw it, with the greatest interest. And often it has been the source of much pleasure to realize that I was perhaps standing upon the very spot from

which he viewed and sketched some striking feature of the landscape, or from which he secured the type specimens of certain plants which he later described. Not less interesting has been the opportunity afforded for comparing the present condition of the country, both as regards the state of civilization and of nature, with that he described a century ago. Changes in the former respect have of course been very great, but as regards the aspect of nature and the wild life, or at least the flora, they are in many places, fortunately, very slight.

With greater leisure and the better facilities of modern travel it has also been possible to explore more thoroughly some of the places which Nuttall in his hasty journey could but touch upon or view from a distance. And therefore in addition to a brief review of Nuttall's journey and Journal, it is my purpose to describe somewhat more particularly the flora of a few of the more interesting localities along the route he followed.

Beginning with the leisurely stage of his journey, from Lancaster to Pittsburgh, which he accomplished on foot, and throughout the long passage down the Ohio and Mississippi rivers, the latter occupying him from October 21st, 1818 to January 12th, 1819, Nuttall introduces into his journal observations on the character of the vegetation and notes on particular trees and other plants of interest; it will be necessary to mention only a few of them here.

Near Steubenville, Ohio, he records seeing the Mistletoe for the first time on the journey, and near the mouth of the Big Sandy River, which forms the boundary between West Virginia and Kentucky, he first observed the Cane (*Arundinaria macrosperma*). Near Owensborough, Kentucky, Cane began to be tall and abundant, and there also he found *Forestiera acuminata* growing. Below Fort Massac, on the present site of the town of Metropolis, Illinois, he mentions finding the One-seeded Honey Locust (*Gleditsia aquatica*) and the pubescent southern variety of the Button-bush (*Cephalanthus occidentalis* var. *pubescens*). Both are still to be found at this place, and had Nuttall been able to explore the vicinity a little farther he might also have found many other interesting plants, such as the Swamp Hickory (*Carya aquatica*), Willow Oak (*Quercus Phellos*) and the Silverbell Tree (*Halesia carolina*).

Between Shawneetown and the present site of Golconda occurs some of the most picturesque scenery on the Ohio River, fully justifying its Indian name, said to signify "The Beautiful". Nuttall did not fail to appreciate this and comment upon the wide and magnificent vistas of the river, checkered with many islands, and upon the bold cliffs and promontories near Battery Rock and Cave in Rock. Of the country bordering the river in this vicinity he says: "The occidental wilderness appears here to maintain its primeval solitude; its gloomy forests are yet unbroken by the hand of man, they are only penetrated by the wandering hunter and the roaming savage."

At the junction of the two great rivers, where now stands the important

town of Cairo, at the southern extremity of Illinois, he tells us: "The whole country here, on both sides of the Mississippi and the Ohio, remains uninhabited in consequence of inundation, and abounds with various kinds of game, but particularly deer and bear, turkeys, geese and swans, with hosts of other aquatic fowls, though with the exception of the white pelican, they are such as commonly exist in many parts of the Union."

Nuttall and his party were constrained to remain here, camping on the Kentucky side, for a day or two on account of the floating ice on the Mississippi, the season being mid-December. He states that the river banks above the point where they had landed were surmounted with an almost impenetrable sempervirent cane brake, some of the canes measuring upwards of 30 feet. Here also they continued to observe the Coffee-bean (*Gymnocladus dioica*), of which he says: "The seeds when parched are agreeable to eat, but produce a substitute for coffee inferior to the *Cichorium*."

In the vicinity of New Madrid he saw abundant signs of the recent earthquakes, in the form of inundated forests and sunken lands, and he says that earth tremors were still prevalent, two or three sometimes occurring in a day. Here he saw the Catalpa (*Catalpa speciosa*) apparently indigenous in the forest. Trees of this species, attaining a large size, were formerly abundant in southern Illinois, and although it has been severely cut for posts and fuel, it is still frequently met with there and along Crowley's Ridge in southeastern Missouri and northeastern Arkansas. However, nowhere in its range have I seen it growing as a pure stand or forming a large part of the forest, and in most places there seems to be some doubt as to whether it is really native or a recent introduction.

Commenting on the forest growth near the mouth of the St. Francis River, the author mentions his disappointment at finding it so similar in composition to that of the middle and northern states. The upland forest, he says, consisted largely of Black Ash, Elm (*Ulmus americana*), Hickory, Walnut, Maple, Hackberry (*Celtis integrifolia*), Honey Locust, Coffee-bean, &c. Buttonwood and enormous Cottonwood trees, some of the latter more than six feet in diameter, were growing on the banks; and he also saw here the Holly (*Ilex opaca*), and the Mistletoe, which was abundant on all of the smooth-barked trees. These huge Cottonwoods, he says, were commonly called Yellow Poplar, and he gives them the botanical name of *Populus angulisans* (probably *Populus angulata* Aiton, which is not now regarded as distinct from *P. balsamifera* L.). The tree he called Black Ash was not *Fraxinus nigra* of the northern forests, and he may have mistaken a form of the White Ash (*F. americana*) or more likely the Pumpkin Ash (*F. profunda*), for it. *Celtis integrifolia* Lamarck is a synonym of *C. laevigata* Willdenow, the common lowland Hackberry of the region.

On landing at a point some miles farther down, and probably near or opposite the present town of Helena, Arkansas, he found the woods almost impenetrable from the entangling growth of Smilax, Supple-jack and *Brunnichia cirrhosa*. Here, he tells us, he for the first time recognized the Short-podded Honey Locust (*Gleditsia brachycarpa*), "A distinct species intermediate with the common kind (*G. triacanthos*) and the One-seeded Locust (*G. monosperma*), differing from *G. triacanthos* in the persistent fasciculated legumes, as well as in their shortness and want of pulp." This tree has since been found at a number of places, generally growing in close proximity to the two other species mentioned by Nuttall, and it is now regarded as being a hybrid between them, and is known under the name *Gleditsia texana* Sargent.

Nuttall reached the mouth of the White and Arkansas rivers, which enter the Mississippi at the same point, on January 14th. And here his real work of exploring the flora of the Territory of Arkansas began.

At this early season, he says, the weather was already mild and spring-like, and the common Butterweed (*Senecio glabellus*) showed signs of flowering. In the neighboring woods he was shown a scandent woody shrub that, he says, proved to be the Carolina Kidney-bean Tree, and which he named *Wistaria speciosa*. He remarks that the branches were so supple that a knot could be tied in them with ease, and that they were often used for ropes or boat cables. This plant is now known by the older name *Wistaria macrostachya*.

While detained near the mouth of the Arkansas River, Nuttall explored the low woods along the banks, and he gives a list of some of the plants. Amongst trees and shrubs which he mentions here are the following: Pecan, Swamp Hickory (*Carya aquatica*), Black Walnut, Blue Ash (*Frazinus quadrangulata*), Sycamore, Hackberry (*Celtis integrifolia*, or as now known *C. laevigata*), Swamp Oak (*Quercus aquatica*, now called *Q. nigra*), Red Oak (*Q. rubra*), Scarlet Oak (*Q. coccinea*), Spanish Oak (*Q. falcata*), Cottonwood (*Populus angulisans*, the identity of which was mentioned above), Smaller White Poplar (*P. monilifera*, now identified with *Populus balsamifera*, as described by Linnaeus, and only an immature form of the trees he first mentions), Common Honey Locust (*Gleditsia triacanthos*), One-seeded Honey Locust (*G. aquatica*) and the Short-podded Honey Locust (*G. brachycarpa*). The Oak which he called *Quercus rubra* was probably not the Northern Red Oak, now known as *Q. borealis* var. *maxima*, but its southern ally *Q. Shumardii* Buckley, while the Spanish Oak is the species now known to have been first described by Linnaeus as *Quercus rubra*. The tree called by Nuttall in this list *Quercus coccinea* can not have been that species, as it is not an inhabitant of low alluvial woods and is not known to occur in that region. There are but three Oaks found in low woods along the Arkansas River which might with any likelihood be confused with *Quercus coccinea*. The first of these is *Quercus Shumardii*, which bears

a much closer resemblance to *Q. borealis* var. *maxima*, for which Nuttall, like all of the early collectors, seems to have taken it. The second is the Pin Oak (*Quercus palustris* Muench.), which is quite uncommon so far south, although it has been found in the Arkansas River bottoms near Little Rock. This tree, however, has a different habit of growth as well as an entirely different habitat from the Scarlet Oak, and the small different-shaped fruit serves to distinguish it unmistakably from the latter species. The third Red Oak of the low alluvial bottom lands is a tree that has long puzzled collectors, and specimens have been distributed under various names, as *Quercus texana*, *Q. Shumardii* var. *Schneckii*, *Q. coccinea*, *Q. ellipsoidalis* and *Q. palustris*. When I first saw this tree in Natchitoches and Ouachita Parishes, Louisiana, in 1915, I was inclined to refer it to *Quercus ellipsoidalis* on the strength of published descriptions and figures of that species, which I had not at that time seen growing. Of course geographical considerations made this very improbable, and a closer acquaintance with the character and habits of the so-called Jack Oak of the Lake Michigan region put it quite out of the question. It is interesting, however, to find that others have hazarded the same opinion as to its identity, as will be seen by referring to the list of specimens at the end of this article. In foliage and habit of growth, trees of this species appear to resemble most nearly *Quercus palustris*, and forms of it might easily be mistaken for that species, when found without fruit, as has sometimes been done. Typical leaves are, however, larger and of a distinctly different shape from those of the Pin Oak and resemble even less those of the Scarlet Oak, but certain forms of all these species approach each other in this respect. But it is mainly on account of the shape and character of the acorns that it has been confused with *Quercus coccinea* as well as with *Q. Shumardii* var. *Schneckii*. It is well distinguished in its fruit, however, from either of these species or from any other Oak.

It is an interesting coincidence to find that this long-neglected Oak was again collected at Arkansas Post, probably near the very spot where Nuttall found it and almost one hundred years after his visit, by Mr. J. H. Kellogg. I am quite convinced that it is a well-distinguished species, not referable to any hitherto described, and a description will be found at the end of this article, under the name of *Quercus Nuttallii*, in honor of the distinguished naturalist who first collected it.

In crossing a swamp near the town of Arkansas Post Nuttall also notes some of the trees. Here, he says, the principal species were *Quercus lyrata*, *Q. macrocarpa*, *Q. Phellos*, *Q. falcata* and *Q. palustris*, with some Red and Scarlet, as well as Black and Post Oak on the knolls or more elevated parts. He also mentions observing in this swamp, *Nyssa aquatica*, *N. pubescens*, *N. biflora* and *Gleditsia monosperma*. He remarks that the fruit of *Nyssa pubescens*, the Ogechee Lime, was prepared as a conserve. About two miles back of the town he visited a lake, from

which, he tells us, a vast prairie opened to view, extending to the north and west, and computed to be not less than 30 leagues in length, by 10 to 15 in breadth. In the alluvial forest between the prairie and the river, where the growth consisted largely of Oak, Hickory, Box-elder and Elm, with Cottonwoods along the river banks, he found a large specimen of *Zanthoxylum Clava-Herculis*, as large, he says, as an ordinary Ash. On March first he found the Red-bud (*Cercis canadensis*) commonly in flower, and on the thirteenth a vine called the June Grape (*Vitis vulpina*) was coming into bloom. On March 21st, however, he records that for several nights there had been frosts of sufficient severity to destroy most of the early Grape, Plum, Paw-paw and Red-bud blossoms, as well as to do great damage to crops. These sudden fluctuations in temperature at the spring season, from summer heat to severe frosts, the thermometer registering only 22 above zero Fahrenheit, as recorded by Nuttall, is one of the principal inhibiting factors against the northward extension of many of the coastal plants, and as he clearly recognized, it largely accounts for the general floristic similarity of the forests in this comparatively low latitude, to those of the states several degrees farther north. Nuttall, in this connection, expresses surprise at the absence of the usual evergreens, Magnolias, Rhododendrons and other plants of the Heath family.

At a point along the river, probably not far from the present town of Pine Bluff, he records finding *Fraxinus sambucifolia* and *F. platycarpa*. The former was perhaps, as before suggested, *F. profunda*, and the latter is now known under the name of *F. caroliniana* Mill. Some distance farther up the river he mentions seeing *Ilex opaca*, conspicuous for the first time along the banks, and, on lands contiguous to the river, thickets of the Chicasaw Plum (*Prunus angustifolia*) were apparently overgrowing the sites of former Indian villages. Above the Little Rock, the Red Cedar (*Juniperus virginiana*) began to appear, with tufts of ferns, along the shelving rocky bluffs. Here he came in sight of a remarkable conical hill, resembling in the distance the cone of a volcano. This conspicuous landmark remained in sight for several days on their slow passage up the river, and Nuttall mentions it more than once. He also made sketches of it as it appeared from two different points, which were reproduced as woodcuts in the Journal of Travels, printed at Philadelphia. This curious hill is called the Maumelle Pinnacle, (or as Nuttall spells it Mamelle) and it is flanked by several lesser elevations called the Little Maumelles. Nuttall ascended one of the latter and from it made a sketch of the higher peak. He says of it:

"To the west, the lofty conic and broken hill called the Mamelle now appeared nearly double the elevation of that on which I stood, probably more than 1000 feet in height. Two miles above it presents the appearance of a vast pyramid, hiding its summit in the clouds."

This description, and the figures showing the great Maumelle, rising

like a narrow-based pyramid from the plain, were so remarkable and so unlike anything I had seen in the region, that I had long been anxious to visit the locality. This opportunity came in May, 1923, when in company with Rev. H. E. Wheeler of Little Rock I spent a day in climbing and exploring these curious hills. The group or range of peaks lies only a short distance back from the Arkansas River, and the distance from Little Rock in a direct line up the river is about fourteen miles. A branch of the Rock Island railway now passes near the base of the mountain, and it is only a mile or two distant from the station of Pinnacle. The mountain or series of peaks really consists of a short serrated ridge, formed by the upturned and almost vertical strata of sandstone of various degrees of hardness and thickness. The axis or crest runs nearly east and west, its eastern end forming a bluff along the Arkansas River, and rising gradually westward until it terminates in the Great Maumelle or Pinnacle, the summit of which is 1250 feet above sea level, or about 1000 feet above the river valley. Some of the lesser hills are formed by parallel ridges. To the north of these hills runs the Maumelle River and along the southern flank the Little Maumelle River or Creek.

Crossing the valley of the smaller stream we approached the mountain, which viewed from this side, although quite striking, is in comparison with Nuttall's figures, rather disappointing. The broken rocky ground sloping gently toward the base of the mountain is covered with a forest of small trees, consisting chiefly of Pine (*Pinus echinata*), Mocker-nut (*Carya alba*), Arkansas Hickory (*C. Buckleyi* var. *arkansana*), White, Black and Post Oak and Winged Elm (*Ulmus alata*). *Ceanothus americanus* and a yellow-flowered *Baptisia*, both in flower at the time of our visit (June 1st), were conspicuous in the rocky woods and for some distance up the mountain-side. We began climbing the peak on the east side, but soon finding it too precipitous we were compelled to work around well towards the northwest before we succeeded in scaling to the top.

From the summit a fine panoramic view of the surrounding country can be had on a clear day: to the west and south lie range beyond range of wooded hills, until their outlines are lost in the purple distance, and to the north and east is seen the winding Arkansas River, with its wide valley still heavily timbered with Cypress and deciduous trees, except where it has been cleared for agricultural use, and beyond this rise other ranges of hills. The city of Little Rock is also in plain view, if the day is clear, besides several other towns and villages.

Trees and shrubs of numerous species common to the region extend up the east and north slopes, where these are not too precipitous, quite to the top of the mountain. Most of the trees are of stunted appearance, increasingly so towards the summit and on the exposed slopes. Amongst the more common species are *Pinus echinata*, *Carya Buckleyi* var. *arkansana*, *Castanea ozarkensis*, *Quercus borealis* var. *maxima*, *Q. velutina*,

Q. alba, *Q. stellata* and *Vaccinium arboreum*. Less commonly are found the Black Locust (*Robinia Pseudoacacia*), Red-bud (*Cercis canadensis*), Hop Hornbeam (*Ostrya virginiana*), the two shrubby Huckleberries (*Vaccinium stamineum* and *V. vacillans*) and the Post Oak Grape (*Vitis Linsecomii* var. *glauca*), most of them extending well up the mountain-side. The Ozark Chinquapin is very abundant on some of the talus slopes. At the time of our visit it was in flower and was very conspicuous on account of the abundance of the long racemose blossoms with a rather disagreeable fetid odor. Some specimens were of large size, perhaps 12 to 15 meters tall, and with a much wider spread of branches. Though arborescent in size it usually divides into several trunks from the base, as it grows at this place. On the rocky ledges the Woolly Lip Fern (*Cheilanthes tomentosa*) was frequent in clefts, and in more open situations the handsome purple-flowered Crucifer *Streptanthus maculatus*, first discovered by Nuttall in this vicinity, was abundant and conspicuous.

Several springs issue near the base on the north side, forming rivulets which find their way into the Maumelle River. At one of these we had lunch, and found the water to be cool and pure, filtered as it is through the sand. *Smilax rotundifolia*, *Vaccinium corymbosum*, *V. virgatum*, *Xolisma ligustrina*, and *X. mariana* were growing along the small stream formed by the spring. And lower down where it spreads out into a little bog, Sweet Gum, Ironwood (*Carpinus caroliniana*), Black Willow and the trident-leaved variety of the Red Maple (*Acer rubrum* var. *tridens*) were common, with the Royal and Cinnamon Ferns, Devil's-bit (*Chamaelirium luteum*) and the little Orchid *Microstylis unifolia* growing beneath them.

A view of the Pinnacle which we had from the north, and probably in line with the point from which Nuttall made his second sketch farther up the river, showed the peak formed by the crest of the narrow ridge of upturned strata, and more nearly resembling the figure of the Journal.

Remarkable as is the structure and appearance of these peaks, there is not much in the character of the flora to distinguish it from that of the surrounding region, and it is much less interesting than that of some of the other mountains. This is probably due to the limited extent and exposed position of the peaks, affording little protection to peculiar or extra-limital species such as have survived in more favored situations.

Some thirty or forty miles up the Arkansas River, Cadron Creek enters it on the north side. Nuttall visited the settlement and projected town site at this point and made it the subject of a sketch that appears in the Journal. As surmised by him, no permanent town was established here.

Cadron Creek flows out of a high and picturesque country, and a few miles above its mouth it is joined by Cove Creek. For several miles the two streams flow parallel, separated only by a narrow rocky tongue of land. The flora, especially along the high bluffs of Cove Creek, is extremely rich and interesting. In the autumn of 1924, accompanied by

Professor Delzie Demaree, of Conway, who had explored the locality rather thoroughly and found many rare plants, I paid a hurried visit to it, and saw *Ilex verticillata*, *Hypericum oklahomense*, *Gelsemium sempervirens* and *Viburnum dentatum* for the first time in Arkansas. In alluvial bottoms near the mouth of the creek the Nutmeg Hickory (*Carya myristicaceiformis*), the King-nut or Large Shell-bark Hickory (*C. laciniosa*) and the Cedar Elm (*Ulmus crassifolia*) are also found.

Some miles below the mouth of the Petit Jean River Nuttall ascended a high rocky ridge that he estimates to be six or seven hundred feet above the level of the Arkansas River. He gives a faithful and familiar picture of the scenery: "a vast wilderness covered with trees and checkered with ranges of mountains." The Maumelle peak was still in sight, although, as he says, at the lowest estimate, forty miles distant. "Over the vast plain immediately below me," he continues, "appeared here and there belts of Cypress, conspicuous by their brown tops and horizontal branches; they seem to occupy lagoons and swamps at some remote period formed by the river." Some of these Cypress swamps are still conspicuous features of the landscape in the vicinity of Morrilton, in spite of nearly a century of lumbering operations and extensive drainage. On the shelving rocks of the mountain from which these observations were made, he records finding a new species of *Anemone* (*A. heterophylla*). A day or two later he inserts a note that "The insects which injure the Morel Cherry-trees in Pennsylvania, I perceive here occasionally act in the same way upon the branches of the wild Cherry (*Prunus Virginiana*). Since this species does not occur in the region, nor anywhere near the state of Arkansas so far as is now known, Nuttall must have mistaken shrubby specimens of *Prunus serotina* for it.

At the Dardanelle rocks, where the river cuts through beds of massive sandstone tilted at a low angle and presenting on the south a very singular and bold facade, there was a considerable settlement of partially civilized Cherokee Indians at the time of Nuttall's visit. The traders' boat in which he was traveling stopped for some time to barter with the natives, and Nuttall improved the time both by interviews with the latter, from whom he learned something about their language, customs and traditions, and also by botanical excursions in various directions, including a climb to the highest points of the cliffs on either side. On the south slopes the Flowering Dogwood (*Cornus florida*), Violets and a parti-colored *Collinsia* (*Collinsia violacea*) were already in bloom, the date being April seventh. The town of Dardanelle now occupies the level land on the south side, just above the rocky headlands. The river at this point was, at the time I visited it in 1924, spanned by a pontoon bridge, one of the longest remaining in the country. It has since, I believe, been replaced by a more substantial if less picturesque structure. A few miles to the south and west lies Mount Nebo, a very striking and considerable mountain, with an area of several square miles of level land

at its summit. A fairly good automobile road has been constructed to the top, which is occupied by the cottages of many summer tourists and some permanent residents. The massive sandstone strata which form the cap rock of the mountain are nearly horizontal or only slightly tilted, and the slopes at many points, subject to rapid erosion, are steep or precipitous. There is some fine timber on the more gradual slopes, consisting largely of Short-leaved Pine (*Pinus echinata*), White, Black and Red Oak, Sweet and Black Gum and several species of Hickory, with a smaller proportion of many other species. Mount Nebo was doubtless one of the mountains viewed by Nuttall from the top of the Dardanelle cliffs, as it is a prominent feature of the landscape there. From that point also, he could still discern the Maumelle peak, although he estimated it to be not less than one hundred miles distant by river and sixty in a direct line. It may have been from this eminence also that he drew the sketch of Magazine Mountain from which was made the woodcut inserted in the Journal. He conservatively estimated the height of this "magnificent empurpled mountain" to be not less than 1200 feet and the distance ten miles. As a matter of fact its base was more than twenty miles from where he stood and the top of the mountain is elevated more than 2000 feet above the surrounding valley.

Magazine Mountain, situated about fifteen miles south of the Arkansas River, is the highest and largest of the mountains of southern Arkansas, and indeed it is easily the most striking feature of the mid-continent elevation. Both on account of its magnitude and its comparative isolation from other peaks, its clear-cut outline is, under favorable atmospheric conditions, an impressive and familiar landmark for many miles in all directions. Viewed in outline against the sky-line from either the north or south side, the homely name given it by the early French hunters, from its supposed resemblance to a barn, seems not inappropriate, however much we might wish that it had received a more dignified or poetic designation. As seen from the south, the direction from which it is now most easily approached and from which most of my ascents were made, the platform or plateau that forms its summit appears as a long line inclined very slightly towards the east for some distance and then falling away more suddenly towards the plain. On the west side there is an extension or lower platform of about two thirds the height of the main elevation. On nearer approach it is seen that the slopes are heavily wooded and dissected along the lower levels by many ravines and chasms. A bold facade of nearly naked cliffs stands out along the margin of the plateau, the summit of which is occupied by a smaller growth of timber.

Like all the mountains of this region, Magazine Mountain is composed of the massive sandstone strata alternating with softer beds of shale and clay, all of the Pennsylvanian series. The structure of the mountain is that of a gentle syncline, the strata being so slightly inclined as to

generally appear horizontal when seen outcropping along the slopes. The surrounding country, however, was subjected to extensive disturbances which left the strata standing at high angles or even perpendicular in many places, but a small area, of which the truncated top of Magazine Mountain is now the remnant, appears to have escaped and to have remained as an island in the general sea of disturbance. This was probably due in part at least to the fact that there was at this point a local thickening in the massive beds of sandstone which now form the cap-rock of the plateau, and which may have been deposited in an estuary along the coast of the old Paleozoic sea. If this hypothesis is correct, the little-disturbed area now represented by the summit of Magazine Mountain probably remained, after the Cretaceous upheaval, as a depression below the general level of the surrounding area with its broken and upturned strata; and its present relative elevation is due to the fact that it has been more resistant to the erosive forces operating through the long subsequent ages, which have broken down and removed thousands of feet of the more vulnerable upturned and unprotected layers.

The plateau which forms the top of the mountain is at present about seven miles in length and from less than half to three quarters of a mile in breadth. It was doubtless formerly much larger, and erosion is now reducing it very rapidly. This can be well seen along the high perpendicular cliffs that form its rim, at the bases of which huge piles of talus have accumulated, which are augmented every year by the toll taken by every storm.

A trail or rough road, practicable only for horses or light vehicles, has been constructed from the village of Blue Mountain, near its southern base, to the top of the mountain. A small hotel for the convenience of summer tourists was until recently operated on the top, near the west end, and a number of cottages are occupied transiently. At one time a number of farms were cleared on the central and eastern part of the plateau, and fairly commodious houses, barns and other outbuildings, now for some years falling to decay, and the partially overgrown remnants of fields and orchards, attest this former occupancy. The difficulties of transportation and communication with the rest of the world proved, however, too great a handicap in the estimation of a younger and more exacting generation, and there were at the time of my visits only a very few families residing on the mountain. The development of a summer resort and a modern hotel have been projected for some time, and doubtless this scheme will be carried out in the near future, as few places if any in the Middle West or South offer such attractions in scenic beauty and climate, were it once made accessible through the construction of a practical roadway.

The slopes and top of the mountain were once all heavily forested; and although the timber has been thinned and the best of the Pine and Oak has been culled out where it could be reached, much of it remains

practically untouched on account of the extremely rugged and inaccessible character of the slopes. On the south side of the mountain the forest consists of a mixed growth of Pine (*Pinus echinata*) and deciduous species, the Pine in some places forming more than half of the stand. Some very fine tall specimens of the Pine are to be seen here. The growth on these sterile sandstone slopes has been extremely slow; an attempt to count the annual rings on a number of stumps, although not very definite on account of their badly weathered condition, indicated an age of from 70 to 115 years for trees fourteen to sixteen inches in diameter. White Oak, Post Oak, Red Oak, Black Gum, Sweet Gum and two or three species of Hickories are the most abundant hardwood trees, with Chinquapin (*Castanea ozarkensis*), Flowering Dogwood, Tree Huckleberry and two low Huckleberries (*Vaccinium vacillans* and *V. stamineum*) as undergrowth. Along ledges and ravines many other trees and shrubs occur, amongst which are the Low Willow (*Salix humilis*), Ward's Willow (*S. longipes* var. *Wardii*), Hop Hornbeam, Juneberry (*Amelanchier canadensis*), Witch Hazel (*Hamamelis macrophylla*), two southern Red Haws (*Crataegus apiifolia* and *C. spathulata*), Redbud, Black Locust, Wild Cherry, Big Tree Plum (*Prunus mexicana*), Red Maple, White Ash, Southern Black Haw (*Viburnum rufidulum*), Sassafras and the low spiny Rose, *Rosa subserulata*. The French Mulberry (*Callicarpa americana*) is found at the lower levels, and the curious little shrub *Andrachne phyllanthoides* was collected on a shale bank near the base. In the protection of ledges that stand out at various levels and along the cliffs about the rim of the table-land, many interesting plants are growing. Here are found the Fringe-tree (*Chionanthus virginica*), Poison Ivy, Juneberry and Wild Cherry, as well as the Marginal Shield Fern and Woolly Lip Fern.

A considerable portion of the comparatively level top of the mountain has been cleared, but much of it has partially relapsed into forest. What appears to be an original growth of White Oak, Post Oak and Hickory remains in some places. Toward the wind-swept western end and along the southern rim all of the trees have a gnarled and stunted appearance, and it is probable that the timber here was never large. The cliffs on the south side are very irregular and broken and are seldom of great height; at some points they are buttressed with bold outstanding promontories or are flanked with detached masses and chimney-like columns. Along the top is often a stunted growth of Red Cedar (*Juniperus virginiana*), Black-jack, Post Oak, Buckthorn or Gum Elastic (*Bumelia lanuginosa*) and Tree Huckleberry.

Farther back in more protected situations the trees are somewhat larger and the flora is much more varied. Here are found the Black Gum, Wild Cherry, Black Walnut, Mulberry, Mockernut, Wafer Ash (*Ptelea trifoliata*), Yellow-flowered Honeysuckle (*Lonicera flava*) and several species of *Crataegus* of the *Crus-galli*, *Pruinosae* and *Macracanthae*

groups. Rich woods conditions prevail on some of the gentle north slopes, and a variety of attractive wild flowers bloom here in season.

While the drainage of the plateau is largely subterranean, a few ravines and small intermittent streams have developed and flow toward the north or south sides. Springs issue from a few of these, even near the mountain top; along one near the south margin a small boggy area has developed, where were collected a Quillwort (*Isoetes Butleri*) and Sphagnum moss, besides several interesting flowering plants. A species of Meadow Beauty (*Rhexia interior*) and the Closed Gentian (*Gentiana clausa*) and *Iris cristata* were found along another brooklet flowing in the other direction. The situation seems very curious for such plants. In some of the old clearings *Pinus echinata* is beginning to establish itself, all of the trees being perhaps less than twenty years of age. This tree does not appear to have gained a footing on the plateau prior to the clearing away of the original forest, probably due to its inability to compete with the deciduous species.

It is, however, on the north side of the mountain that the most interesting conditions prevail. The cliffs here are much higher and more precipitous, in many places having a sheer perpendicular face of from one to two hundred feet. The views, looking down from some of the outstanding points into the dark wooded gorges a thousand feet or more below, are truly magnificent, and on clear days a wonderful panorama of the surrounding country is spread out. Nowhere else in this unusually picturesque part of America have I seen anything that approaches it, and for variety and beauty perhaps few finer views can be had even in the higher mountains.

Along the margins of these bluffs are found the Shellbark Hickory, Red and Chinquapin Oaks, Juneberry, Wafer Ash, Buckeye (*Aesculus glabra*), Linden (*Tilia floridana*), Ninebark (*Physocarpus intermedius*) and Sugar Maple. The leaves of some of the Amelanchier bushes observed here in October were of a brilliant red color, between scarlet and crimson, while on others close by, the foliage was still green or of a pale yellow tint. Whether there were any other differences amounting to varietal distinctions it was impossible to tell in the absence of flowers or fruit.

Just below the top of the cliffs and along its upper ledges the Broad-leaved Mock Orange (*Philadelphus pubescens*) is very abundant, and during the blooming season, in the latter part of May, it makes a wonderful display with its abundant waxy white blossoms in the romantic setting of these castellated rocks. In the same situations, and equally abundant, is the Prickly-fruited Gooseberry (*Ribes Cynosbati*), and here too was found the Mountain Woodsia (*Woodsia scopulina*), this being the only station known for it at present between the Appalachian Mountains of South Carolina and the western Rockies. As one descends the slopes below the cliffs, the trees increase in size and density of growth, as well

as in variety of species. There is no Pine on this side of the mountain, but there are many magnificent specimens of White and Red Oak, Black Gum, Black Walnut, Sugar Maple, White Ash, Linden and Hickories. One of the Hickories, usually having a tall symmetrical trunk, clothed with pale, reticulately ridged but close bark, may represent an undescribed species. The same species has also been observed on the north slopes of Rich Mountain, Oklahoma. It appears to be somewhat intermediate between *Carya alba* and *C. Buckleyi*.

Springs are much more abundant and of larger volume here than on the south side of the mountain, and some of them follow ravines, which, starting on a small scale near the top of the mountain, develop into deep rocky gorges and canyons, which are difficult to follow and almost equally difficult to escape from. About some of the springs and on dripping ledges, Sphagnum moss is abundant, with a variety of ferns, one or two Orchids and various other moisture-loving plants.

Deposits of rich soil and humus have accumulated in coves and along ledges far down on the mountain side. Here are found the Spice-bush (*Benzoin aestivale*), the Bladder-nut (*Staphylea trifolia*), Tear-blanket (*Aralia spinosa*), Cucumber tree (*Magnolia acuminata*) and Yellow Wood (*Cladrastis lutea*). The Oaks, Hickories, Ash, Sugar Maple, Walnut, Black Gum and Linden also attain a large size in such places, and in the dense shade and abundant moisture an herbaceous flora of decidedly northern aspect flourishes. *Botrychium virginianum* and the Fragile, Maidenhair and Christmas Ferns, the Broad-leaved Sedge (*Carex laxiflora* var. *latifolia*), Blue Cohosh, White-fruited *Actaea* and two species of *Trillium* are characteristic plants of these rich coves, to the deeper recesses of which full sunlight seldom penetrates. Extensive areas below some of the high cliffs are occupied by the rubble derived from them in the course of ages. These loose deposits sometimes have a steep slope and the forest trees and shrubs can make little headway upon them. Sometimes, however, isolated individuals or small colonies of Chinquapin, Yellow Wood or other small trees have gained a foothold, and the Winter Grape (*Vitis cordifolia*) trails widely over the rocks or the Prickly-fruited Gooseberry, Bladder-nut, Hydrangea or other shrubs flourish in the clefts. *Polymnia canadensis* is also very common and characteristic of such places, and in the protection of the moss and lichen-covered boulders grow the Northern Polypody (*Polypodium virginianum*), the Walking-leaf Fern, Mountain Woodsia and several other ferns and small flowering plants. The presence of some of these plants and the abundance of thick-shelled snails amongst the rubble and humus, indicates that lime is not entirely lacking in the composition of the rocks, a fact that is confirmed at other points in the region by the presence of calcified fossils in the Pennsylvanian sandstone.

In small rocky glades and sterile eroded areas on top of the mountain many prairie plants are found. Grasses, Composites and Legumes are

amongst the most abundant, and along exposed ledges grows such xerophytic species as *Polygonum aviculare*, *Paronychia dichotoma* and *Opuntia humifusa*.

In the open woods bordering the cliffs and along their margins there is growing a shrubby or semi-arborescent Oak of such distinct and striking character that it does not seem possible to refer it to any described species. It seems confined to this side of the plateau, but is not rare locally, some scores of specimens having been examined. Characteristically it grows as an arborescent shrub, sending out numerous spreading slender boles or stems from a common base much as does the Chinquapin. Rarely it appears to grow into a small tree with a single stem, which is usually crooked or deflexed. The specimens seen range in height from three to about eight or nine meters, and some of the smaller ones were fruiting. The leaves are nearly always broad-based and cordate, and are often broader than long, somewhat resembling those of the Sugar Maple. In autumn they turn a bright crimson as in the Scarlet Oak. It is clearly related to the Red Oaks and to the *Quercus Shumardii* group, to which I am referring it as a variety.¹

Having thus hastily sketched the structure and flora of the largest and most interesting of the mountains of Arkansas, that in distant view excited the admiration and interest of Nuttall, more than a century ago, but which he was unable to explore at that time, let us now return to his further travels.

On April 20th he proceeded up the river, from the Dardanelle rocks, in a pirogue with two French boatmen. The beauty of the scenery, enhanced at this season by the budding verdure, the songs of birds and the humming of the wild bees in the Willows (*Salix caroliniana* or *S. nigra*, as it is now known) is enthusiastically described. He mentions passing the mouths of Carbonniere, Spadra, and Piney Creeks, and seeing in the distance a lofty blue ridge called by the French hunters the Cassetête or Tomahawk Mountain, which he thought, bore some resemblance to the Magazine, and beyond, another range called the Gascon Hills. The scenery along the Arkansas River in this part he compares with that of the Ohio, to which indeed it bears considerable resemblance. On the 24th he arrived at the garrison of Belle Point, which he made his depot of supplies and base for his further explorations. In the vicinity of the fort he found many attractive flowering plants, several of them new to science. The Bow-wood (*Maclura pomifera*) was growing on the hills bordering the Poteau (or as he spells it Pottoe) River; some of these were 50 or 60 feet high and with trunks as much as 12 inches in diameter. Amongst other herbaceous plants which he mentions finding on a trip to Cedar Prairie was one belonging to the family *Hydrophyllaceae* which he made the type of a new genus (*Nemophila phacelioides*).

About the middle of May Nuttall set out, with a military party from

¹See p. 54.

the post, on a journey to Red River at the point where it is joined by the Kiamichi. The official object of the expedition was the unpopular one of removing all of the unauthorized white settlers from territory that had been assigned to the Osage Indians. Their route led them through the extremely rough, mountainous country of eastern Oklahoma, and farther on over the comparatively level prairie lands, underlaid by the Cretaceous limestone.

Nuttall gives some faithful descriptions of the country traversed, mentioning again the conspicuous mountains, called the Cavanal (spelled by him Cavaniol) and the Point de Sucre or Sugar Loaf, which he had previously seen from the river and the vicinity of the fort. He mentions in this part of the region, as elsewhere, the abundance of wild game, the party overtaking and killing two bears and encountering herds of bison and deer. Some of the rugged country along the Kiamichi, he suggests, strongly resembles the mountains of the Blue Ridge, at Harper's Ferry.

When the military party, having fulfilled their mission, began the return, Nuttall in his eagerness to collect more of the interesting plants of the prairies lingered behind, expecting to overtake them at a camp where they were to spend the night. However, having lost the trail, night overtook him and he was induced to remain until morning at the house of a settler, which he had fortuitously reached. Four guns which he fired in response to a similar signal from the commanding officer of the company were unheard by the soldiers, and as his horse strayed away during the night, he was unable to overtake them the following morning. His comment on the situation is interesting and rather characteristic: "My botanical acquisitions on the prairies proved, however, so interesting as almost to make me forget my situation, cast away as I was amidst the refuse of society, without money and without acquaintance; for calculating on nothing more certain than an immediate return, I was consequently unprovided with every means of subsistence." The seriousness of his predicament can only be appreciated by one somewhat familiar with the rugged and difficult character of the intervening country, much of which still remains almost in its primitive condition.

Here, perforce, he remained for several days at the house of a pioneer family whose generous hospitality, in spite of their meagre resources, he gratefully records. The time was spent by Nuttall in exploring and collecting the plants of the surrounding prairies. The beauty and variety of this early summer flora again excited his enthusiastic admiration, and he also tells us of the pleasure he experienced upon hearing here for the first time the song of the mocking-bird. Having heard of some hunters who proposed making a journey towards the fort, in search of horses that had been stolen from them by the Cherokees, he joined their party and set out into the wilderness. Becoming involved, however, in the intricacies of the mountains, they soon lost their bearing and wandered for several days before emerging into the valley of the Poteau River and

finding their location. Along the summit of the mountains near this stream, he writes, they passed through thickets of dwarf Oaks “(*Quercus chinquapin*, *Q. montana* and *Q. alba*).” These shrubs must have been the species now known as *Quercus prinoides* Willdenow, which is found abundantly in parts of eastern and central Oklahoma; and they may have been in part also hybrids between that species and *Quercus alba* (*Q. Faxonii* Trelease) or *Q. stellata*, the latter hybrid apparently having been found in Oklahoma and Kansas.

After remaining a few days at the garrison, Nuttall secured passage on a small boat bound for a trading establishment at the confluence of the Verdigris River with the Arkansas, 130 miles above the fort.

The beaches of the river which they passed abounded, he says, with natural orchards of the Chicasaw Plums. Near the mouth of Salisau Creek he saw for the first time near the Arkansas the Hazel (*Corylus americana*) and the American Raspberry (*Rubus occidentalis*). Both, however, are found, though not commonly, at a number of places in central Arkansas and eastern Oklahoma. Above the mouth of the Illinois River he observes the rapidly diminishing variety of the trees forming the forest. Along the river here they scarcely saw anything but the Smooth-barked cottonwood, Elm, Box-elder (*Acer Negundo*), “Curled Maple” (*Acer dasycarpon*, now called *A. saccharinum*) and Ash, all of them of reduced size. On the narrow strip of alluvial land, between the Grand River and the Verdigris near their confluence with the Arkansas, the forest again appeared more varied and the trees of larger size. Amongst them, he says, were lofty Scarlet Oaks, Ash and Hackberry, and the Nettle (*Urtica divaricata*) also covered many acres. From what I have seen of the Oaks in this vicinity, I assume that the species he called Scarlet Oak was in reality *Quercus Shumardii* var. *Schneckii*. Some thirty or forty miles up Grand River from this point he discovered on the rocky bluffs a large shrub, related to the Smoke-tree of southern Europe. To this he subsequently gave the name *Rhus cotinoides*, but later, recognizing that it was generically distinct from the true Sumachs, he rechristened it *Cotinus americanus*, by which name it is now known. This shrub or small tree, as it becomes in some places, is still one of the rarer and one of the most interesting of American woody plants. The fact that it has been found at several widely scattered stations from eastern Tennessee to western Texas clearly indicates that the generally local and small colonies are but relics of its once more general distribution. A few years ago I found it growing on high alluvial banks of the Ohio River just below Owensboro, Kentucky, a point that Nuttall passed in the earlier stages of his journey. However, it may have been a more recent introduction there, as it is usually found only in rocky ground and along bluffs.

About fifty miles up the river, near the mouth of Saline Creek, he says that Cane still continues to be abundant. On high alluvial ground near

the same place he also observed "the Coffee-bean Tree (*Gymnocladus canadensis*), the Over-cup White Oak (*Quercus macrocarpa*), the Pecan (*Carya olivaeformis*), the Common Hickory, Ash, Elm, and below, in places near the margin of the river, the Poplar-leaved Birch (*Betula populifolia*). The Hickory referred to may have been *Carya ovata* or possibly *C. Buckleyi* var. *Arkansana*. The Poplar-leaved Birch, however, is not found anywhere near this part of the country, and the trees he mistook for it were doubtless the River Birch (*Betula nigra*), the only species of the genus that extends so far southwest. Nuttall returned to the mouth of the Verdigris from this short excursion by walking the distance of about thirty miles across the prairies. Not a tree, he says, appeared except along the brooks of Grand River and the Verdigris.

After returning to the settlement Nuttall again set out, accompanied by a trapper and hunter for the purpose of continuing his explorations up the Arkansas River and into the territory to the southward. They were now well beyond the wooded mountains and on the border of the great plains. Early on the journey he records finding "a second species of *Brachyris*, pungently aromatic to the taste, and glutinous to the touch; its aspect is that of *Chrysocoma*." This plant was later described by him under the name *Amphiachyris dracunculoides*.

Some time before starting on this excursion Nuttall had experienced a slight attack of the malarious fever, which was the scourge of many of the early settlements along the western rivers. This was doubtless due, as is now known, to the abundance of mosquitoes bred in the stagnant waters along their courses, the annoying frequency of which the author had mentioned many times. This malady now recurred with increasing severity and the alarming symptoms of delirium and nausea. This was aggravated too by the high temperature, the thermometer standing between 90 and 100°, by the absence of shade and especially by swarms of flies. After several days of this debilitating sickness he writes: "The heat of the weather continued excessive; and the green blow-flies, attracted by the meat brought to our camp, exceeded every thing than can be conceived. They filled even our clothes with maggots, and penetrated into the wounds of our horses, so as to render them almost incurable." Nuttall now grew so weak from the effects of the fever that he was scarcely able to travel; for three days he tasted no food and for some time subsisted principally on wild honey diluted with water.

The country they had been traversing was beset with thickets and ponds, but Nuttall says little about the flora at this time. He mentions some ponds of great extent, in which were growing thousands of acres of the great Pond-lily (*Cyamus luteus*, or as now called, *Nymphaea advena* or *Nuphar advena*). Growing here he also found *Thalia dealbata* and *Zizania miliacea*. They at length emerged on the prairies; but now they were beset by the fear of hostile Indians, traces and the lurking presence of whom they saw on several occasions. After hastily breaking up their

camp to escape the marauders, they proceeded to move to a safer position. But Nuttall had now become so enfeebled that he could not walk and had to be assisted by his companion to get on and off his horse. In this condition he also suffered greatly from exposure to storms and the unavoidable soaking of clothing when streams had to be crossed, as well as from cold when a sudden drop in the temperature occurred. Nights of delirium and days of difficult and dangerous travel ensued as they pushed on, often short of provisions and without potable water, across unknown country, until at length he and his companion came out upon a branch of the Canadian River. The upland divides which they crossed before reaching this stream he describes as "deeply undulating country, abounding with clear grit springs, but the land poor and covered with scrub Oak, except occasional prairie openings and narrow valleys." The small Chinquapin Oak, he says, was found by acres, running along the ground as in New Jersey. They proceeded to follow the stream, and here they felt the loss of the spring water, as that of the river was saline and nauseous. Before they had gone far down the stream Nuttall's companion had the misfortune to lose his horse, through its becoming mired in a ravine. In this dilemma his only resource was to construct a canoe in which to transport himself and baggage down the river. Nuttall attempted to follow with his horse along the banks of the Canadian and the Arkansas, which they at length reached. Traveling along the sand beaches, which he describes as being "hot and cheerless as the African deserts," and at places through almost impenetrable thickets and across the estuaries of tributary streams, he at length found himself unable to keep up with the hunter, and they agreed to part. Through all this part of the journey they had been harassed by the lurking Indians and by their importunities and threatening attitude when they encountered them. Feeling constantly in danger of robbery or perhaps of their lives as the marauders followed them stealthily, they were afraid to build fires or lie down to rest.

After leaving his companion, and provided only with a small supply of elk meat, Nuttall's distress and alarm was soon increased by the discovery that his gun and powder were rendered useless through the latter becoming wet, and that he had no means of obtaining fire or provisions. Leaving the river he struck out over the wooded hills, hoping to reach the Verdigris settlement. As night overtook him in an impenetrable thicket he tells us, "I had to lie down alone in the rank weeds, amidst mosquitoes, without fire, food or water, as the meat with which I had been provided was raw and spoiled by the worms." The next day he had the good fortune to arrive at the settlement, an asylum, which he says, probably at that time rescued him from death. Weak and exhausted from long exposure and sickness, he was seized with the most violent cramps, and they were compelled to cut the clothing from his swollen limbs. In this condition he remained for several days, racked

with pain and fever and dwelling in delirium on the scenes of his past sufferings, until he was at length able to return by boat to the garrison at Belle Point.

We need not follow further the adventures of Nuttall, as his speedier return journey was down the Arkansas river, reversing the route he had laboriously followed in the upward passage. Even in the few short months intervening between his visits to Arkansas Post and some of the other settlements he found them greatly changed and augmented in population and industries. Already the first press had been established at the territorial capital, the new governor had arrived and the additional number of lawyers, doctors and mechanics was noticeable, while ambitious plans were being launched for new towns and added enterprises in those already established.

He had now completed his exploration of the Arkansas Territory, so far as the time and means of transportation permitted, and for the first time as a result the scientific world learned something of its extremely interesting flora and fauna, besides much other valuable information. In his passage down the Mississippi River to New Orleans he makes a number of comments on the forests and flora as he observed them from the boat. But as there is little new or of interest mentioned, at least until he had passed beyond the boundaries of Arkansas, it is scarcely necessary to mention them, except for the note that he first observed the Long Moss (*Tillandsia usneoides*) in the Cypress bend, about 40 miles below the mouth of the Arkansas.

In estimating the value of Nuttall's work and the courage and devotion displayed in his journey through Arkansas, it is necessary also to have in mind the general status of science in America in the second decade of the Nineteenth Century.

The country had but recently emerged from its second struggle with Great Britain, and the pressing material demands of reconstruction and expansion and of developing industry in a new country were such as to leave little time or resource for the promotion of less practical objects. The first foundation stones of American literature and art were being laid, and a creditable beginning had already been made in several branches of science; but native literature descriptive of the flora and fauna was as yet very meagre. Hitherto the work of exploring and describing the natural history of the New World had been largely carried on by visiting scientists and explorers from Europe. The Michaux, father and son, had traveled extensively in the Eastern and Southern States, and as a result of their efforts elaborate descriptions of many of the American trees and lesser plants had been published in France; and it was largely through the incentive furnished by their work that Nuttall was led, as he relates in the preface to his *Silva*, to undertake the further exploration of American botany. Gronovius (and Linnaeus) had in 1739, published the *Flora of Virginia*, based upon the collections of John Clayton, an

English physician and botanist long resident in Virginia. Peter Kalm, a Swedish naturalist, had visited the Colonies from 1748 to 1751, and an account of his travels had appeared in 1753. Thomas Walter's *Flora Caroliniana*, written in Latin, was published in London in 1788, the author being also an Englishman who had settled as a planter and physician in the Colonies. Numerous other scientific visitors, such as Du Pratz, Dwight, Darby, Brickell, Bradbury and Pursh, had through their writings, added something to the interest in and knowledge of American forests and botany.

Such domestic interest as existed in the various branches of natural science was confined mainly to a few of the larger centers of population along the Atlantic coast. Philadelphia, as the metropolis of the country and the chief seat of its wealth and culture, naturally took the leading position in these matters. The early establishment of the Academy of Natural Sciences in that city and the development of Bartram's Garden, the first attempt at a botanical garden in America, were factors in securing that leadership. The most important contribution towards a general knowledge and appreciation of the American flora from a native source was undoubtedly found in the work of John Bartram and of his son William, both of whom travelled and wrote upon the native flora and other branches of natural history, in addition to the practical work carried on in plant introduction and culture at the Garden established by the elder Bartram.

The first technical book on American trees by a native author had appeared in 1785, being the "*Arbustrum Americanum*" of Humphrey Marshall, a work in which the accepted binomials of many of our American woody plants were originally published.

Museums had at this time already been established in several of the larger towns, but they were in the main merely collections of curiosities. Thomas Jefferson, through his interest in the antiquities and natural history of his native state and his writings on these subjects, some of which were communicated to the American Philosophical Society, had brought upon himself some ridicule from his political opponents. A penchant for digging up antediluvian bones and pottering over useless or pernicious plants and birds was considered fair game by the wits of the period, an attitude of mind that does not seem to have been entirely outgrown even in our own enlightened times.

In the newer parts of the country, that vast and largely unknown empire recently acquired from France, that lay beyond the Mississippi, men were as yet quite too busy with the practical problems involved in subduing the wilderness and wringing from Nature the means of satisfying their more primitive needs, to have either the time or the inclination for admiring her beauties or delving through long and patient study into her guarded secrets. The rugged and practical types of men who were first attracted to the frontiers, and who as trappers, traders and

pioneer settlers were all unconsciously playing the heroic roles of advance guards in the march of civilization, could scarcely be expected to place much value on such matters or to understand or have fellowship with the abstractive philosopher or ungainful scientist. When we consider all these circumstances and the amusing but often embarrassing curiosity and incredulity that the student of natural history encounters even today in that part of the country, we cannot help wondering what must have been the attitude of the stolid pioneers towards a traveler whose avowed purpose was neither the acquisition of lands, the purveying of merchandise nor the service of government, but merely the curious study and collection of rocks, birds and plants and the exploration of Indian antiquities.

Thomas Nuttall was born in Yorkshire, England in 1786 and emigrated to the United States in 1808, remaining in this country until 1842, when he returned to England to take possession of an estate near Liverpool, that he had inherited, and where he died in 1859. Most of the active and fruitful years of his life were therefore spent here; and his fame as a naturalist rests almost entirely upon his work on the North American flora and fauna. His contributions to these sciences may therefore be considered distinctively American.

Besides the journey reviewed in the present paper, Nuttall traveled extensively in other parts of America during his residence of thirty-four years here. Most of his earlier explorations in the interest of science were in the Eastern States, extending ultimately from Canada to the Carolinas and Florida. In 1810-'12 he, together with John Bradbury, a naturalist of Scotland, accompanied Hunt and Stuart on their expedition to the mouth of the Columbia River for the purpose of establishing the fur trading post of Astoria at that point. In 1834-'35 he made a second trip up the Missouri River and to the Columbia River region, this time with the party led by Captain Wyeth and accompanied by John K. Townsend, who has left an account of the journey. Before returning from this trip Nuttall also visited the Hawaiian Islands and California.

From 1822 to 1834 Nuttall held the position of Curator of the Botanical Garden at Cambridge and lecturer on Natural History at Harvard College. Some of his literary work was done here during this period; but most of it, including the "Journal of Travels to the Arkansas Territory," was prepared and published at Philadelphia. The most important of his botanical works are, "The Genera of North American Plants," 2 volumes, 1818, and "The North American Silva," 3 volumes, 1842-'45; besides many memoirs and papers published mostly in the Journal of the Academy of Natural Sciences of Philadelphia, and the Transactions of the American Philosophical Society, of the same city. The journey to Arkansas, in addition to the Journal, resulted in the description of several new genera and many new species of plants, besides an uncompleted work, "Collections towards a Flora of Arkansas,"

communicated to the Philosophical Society. He is also the author of "A Manual of the Ornithology of the United States and Canada," in two volumes, 1834-'40, a work that is still regarded as authoritative in its field, and of some papers on mineralogy.

As an appendix to the "Journal of Travels into the Arkansa Territory" he published "An Account of the Ancient Aboriginal Population of the Banks of the Mississippi and the Contiguous Country," in which he quotes freely and at length from the account given by Purchas¹ of the travels and observations of Ferdinand de Soto in the Mississippi Valley and into the present limits of Arkansas. There are also appended papers on "The History of the Natchez" and "Observations on the Chicasaws and Choctaws," as well as a table of "Thermometrical Observations in the Arkansa Territory," which is the earliest temperature record available for that part of the country.

Not only were the scientific attainments, of Thomas Nuttall varied, but his views and interests in regard to other matters appear from his writings to have been equally broad and catholic. He was at the same time almost a recluse in his tastes and habits, and like many philosophers, it was his inclination to withdraw as far as possible from contact with the practical and aggressive world and find solace in reflection and study and in solitary rambles for communion with nature. There was a strong vein of poetry in his nature that is often apparent in the colorful passages of his writings and in many of the names which he fancifully applied to the genera and species of plants which he described. Besides those names drawn directly from Greek mythology such examples as *Chrysopsis* (aspect of gold), *Phoradendron* (robber of a tree), *Nemophila* (loving the grove) and *Erigenia* (born in the spring), are a few examples. As a naturalist his insight was keen and his work of a high order, as was attested by his contemporaries and confirmed by the more critical standards of later times.

The generic name *Nuttallia* has been proposed by various authors for plants of several different families, to commemorate his name and as a tribute to his labor and skill in the field of botany. The genus to which it is now applied belongs to the family *Loasaceae*; and there are a number of species of the genus found in the southwestern United States and Mexico. A large number of species in many groups have also been named in his honor, and the name "*Nuttallii*" is familiar to all students of plants in the regions where he collected.

The present paper can add little to the well-established fame of the gifted naturalist and pioneer American botanist and explorer, Thomas Nuttall, but it is hoped that by calling attention to the indefatigable zeal and courage displayed by him in initiating and carrying out the solitary journey to Arkansas, which considering all the circumstances was perhaps the most hazardous and arduous of his travels, it may serve

¹ Purchas, Samuel.—Purchas, his Pilgrims, London, 1625.

to arouse a renewed interest in his work, especially that part of it dealing with the flora, not thoroughly known or explored even today, of the southern part of the mid-continent region, that he so interestingly described in the "Journal of Travels into Arkansa Territory."

Quercus Nuttallii, sp. nov.

Arbor pyramidata circiter 22m. alta (vel interdum altior), tenuiter ramosa; ramis ascendentibus cinereis vel cinereo-brunneis inferis horizontalibus vel leviter dependentibus; ramulis annotinis olivaceo-viridibus vel rubro-brunneis; trunci cortice laevigato vel paulo fissus usque ad 3 cm. crasso atro-cinereo raro cinereo-brunneo; gemmae conicae vel ovoideae, 4-6 mm. longae, rufo-brunneae apice ciliato-pubescentes. Folia ovata vel elliptica, 8-16 cm. longa et 5-12 cm. lata, apice acuta vel acuminata, basi cuneata vel in petiolum gracile 3-5 cm. longum attenuata, profunde sinuata-lobata, sinibus obtusis raro apice paulo contractis, lobis 5-7 setaceo-mucronatis, pari imo anguste deltoideo integro recto vel apice paulo recurvato, secundo tertioque paribus latioribus lobato-dentatis; junioria glabra, superne laete viridia, subtus paulo pallidiora glabra venularum axillis barbatis exceptis, matura papyracea sed firma barbulis axillorum persistentibus. Fructus sessilis vel brevipedunculatus, glande brevi-cylindrica vel ovato-oblonga 20-28 mm. longa 12-20 mm. lata brunnescente vel olivaceo-brunnescente $\frac{1}{3}$ - $\frac{1}{2}$ in cupula profunda inclusa; cupula hemisphaerica vel turbinata basi stipitato-attenuata intus velutina extus imbricato-squamosa, squamis oblongo-ovatis apice obtusis laxis puberibus.

A tree up to 22 meters (72 feet) tall, or perhaps sometimes taller, usually with a narrow pyramidal crown and slender ascending branches, or the lower horizontal or slightly drooping. Bark of the young branches olive-green tinged with red or reddish-brown, that of the larger branches smooth, gray, cinereous or slate-color, becoming dark brownish-gray and slightly fissured on old trunks, seldom 3 cm. (1 inch) thick. Leaves typically obovate or elliptic in outline, 8-16 cm. long, 5-12 cm. broad (rarely smaller), with acuminate apex and cuneate base attenuate into the slender 2-5 cm. long petioles, deeply divided by wide usually obtuse or sometimes slightly contracted sinuses into five or seven lobes, the lowest pair usually narrowly deltoid and entire with straight or slightly recurved points, the upper successively larger and more or less toothed, the terminal one often long-acuminate and provided with several teeth or secondary lobes, the points all terminating in conspicuous 4-10 mm. long bristles; the young leaves thin and of pale yellowish-green color on both sides or slightly paler beneath, glabrous above and provided beneath with conspicuous tufts of tomentum in the axils of the veins, but otherwise glabrous; at maturity firm but thin and with the axillary tufts of tomentum persisting. Fruit sessile or very short-stalked; nut short-cylindric or oblong-ovoid, usually full and rounded at

the base and apex, glabrous at maturity or often slightly pubescent especially towards the apex, olive-brown or light chestnut in color, 20–28 mm. long, 12–20 mm. in diameter (rarely smaller); $\frac{1}{3}$ to $\frac{1}{2}$ enclosed in the deep turbinate, hemispheric or cup-shaped cup, which is abruptly attenuate into a conspicuous scale-covered base 3–7 mm. long; the imbricated cup-scales oblong ovate, gradually narrowed above the broad base to the obtuse apex, thin, rather loose, puberulous or pubescent. Winter-buds ovoid or conic, gradually narrowed into the obtuse apex, 4–6 mm. long, bronze-green or reddish-brown, the ovate scales slightly pubescent or ciliate, especially towards their tips.

This long-neglected tree seems to represent one of the best-defined species of the obscure and difficult Red Oak group. It is apparently widely distributed, though seldom common, in the rich alluvial lowlands of the Coastal Plain, where it is often found growing in flood-plains subject to inundation, or even on the borders of swamps. I have never found it forming a large percent of the forest even in such places, but Mr. T. G. Harbison notes on one of his labels that it is a common tree in the delta about Morehead, Mississippi. In general habit the trees bear perhaps a closer resemblance to the Pin Oak (*Quercus palustris* Muenchhausen) than to any other species. The leaves also, although averaging larger, somewhat approximate through their range of variations those of the Pin Oak, and in some forms, where fruit and winter buds are absent, it is difficult to distinguish them from those of that species. The fruit, however, is very different and does not even indicate a close relationship with the Pin Oak, but is much nearer to that of *Quercus coccinea*, from which it is distinguished by the more pronounced constantly stipitate base of the cup, the different winter buds and the generally different type of leaves, with open sinus and simple, straight or recurved lower lobes, and especially by their conspicuous axillary tufts of tomentum. The habitat is also entirely different from that of the Scarlet Oak. But with the broader conception of species prevailing in Nuttall's time it is not at all surprising that it should have been mistaken for *Quercus coccinea*. From *Quercus Shumardii* var. *Schneckii*, to which specimens from this species have often been referred, it is even better distinguished by the much deeper cups with looser more pubescent scales, and by the thinner, less veiny leaves, generally of quite a distinct type. It is also well distinguished from the other Red Oaks by its much smoother bark, which resembles more that of the Water Oak (*Quercus nigra*), and which only becomes moderately rough, with broad shallow ridges, on the oldest trunks. On some specimens of the proposed species the leaves are lyrate pinnate and resemble in shape some forms of *Quercus lyrata*.

DISTRIBUTION. In rich alluvial lowlands of the Coastal Plain, from western Mississippi to eastern Texas and northward in the Mississippi Valley to southeastern Missouri (?) and Arkansas exclusive of the Ozark region.

SPECIMENS EXAMINED. **Arkansas:**—Arkansas Post, *J. H. Kellogg*, Sept. 28, 1909 (distributed without specific name; the lobes in this specimen are narrower than in the typical form); Arkansas City, *G. W. Letterman*, 1881 (distributed as *Q. rubra*); Duvall Bluff, Prairie County, *E. J. Palmer*, nos. 24345, 24346 & 24353, Oct. 24, 1923; McNab, Hempstead County, *E. J. Palmer*, nos. 29458 & 29462, Oct. 29, 1925. **Mississippi:**—Morehead, *T. G. Harbison*, nos. 3 & 8, May 31, 1915 (“low rich bottoms, common”; the former number without specific name, the latter as *Q. ellipsoidalis?*, both without fruit.); Vicksburg, *T. G. Harbison*, no. 9 (type) 10 & 11, Oct. 27, 1916; (“River bottoms”; all as *Q. ellipsoidalis?*). **Louisiana:**—Richland Parish, *R. S. Cocks*, no. 1915, Sept. 21, 1910 (as *Q. texana*); Munroe, *C. S. Sargent*, Oct. 8, 1913 (as *Q. texana*; later changed to *Q. Shumardii* var. *Schneckii*); Windsor, Ouachita Parish, *E. J. Palmer*, no. 8935, Oct. 13, 1915; Chopin, Natchitoches Parish, *E. J. Palmer*; no. 8835, Oct. 5, 1915. **Texas:**—Liberty, Liberty County, *E. J. Palmer*, no. 12774, Sept. 17, 1917.

Other specimens that may belong to this species are: **Missouri:**—Paw Paw Junction, *B. F. Bush*, no. 224, Sept. 3, 1897 (as *Q. palustris*); Butler County, *B. F. Bush*, no. 3770, Oct. 19, 1905 (as *Q. palustris*). **Arkansas:**—Moark, *B. F. Bush* no. 2645, May 4, 1905; (as *Q. palustris*; without fruit); Corning, Clay County, *E. J. Palmer*, no. 6069, June 24, 1914; (as *Q. palustris*; with immature fruit).

In the two Missouri specimens the fruit-cups are much shallower than in the type or other collections, but in other respects they resemble our proposed species. The fruit being much too large for *Q. palustris*, they had been transferred in the herbarium to *Q. Shumardii* var. *Schneckii* as had nearly all of the other specimens listed above, all of which are in the herbarium of the Arnold Arboretum.

***Quercus Shumardii* var. *acerifolia*, var. nov.**

Frutex 3–6 m. altus vel raro arbor usque 9 m. alta. A typo recedit foliis brevi-ovatis, brevi-obovatis vel reniformibus latioribus saepe quam longis trilobatis vel quinquelobatis basi truncatis vel cordatis, iuvenilibus subtus floccoso-pubescentibus, mox glabrescentibus venis exceptis; fructu minore $\frac{1}{5}$ – $\frac{1}{3}$ in cupula brevi-cyathiforme inclusa.

A shrub or small tree 3 to 9 m. (10–25 ft.) tall, usually with several spreading or ascending boles arising from a common base, and with erect or ascending branches forming a round top, or rarely becoming a small tree with branching or crooked trunk up to 3 decimeters in diameter. Bark on the branches of the year reddish-brown or olive tinged with red; on older branches gray, gray-brown or slate-color, often mottled with paler blotches; on old trunks sometimes becoming rough and furrowed and of a dark gray or almost black color. Winter-buds ovoid-conical, abruptly pointed or rounded at the apex, 4–6 mm. long with nearly glabrous ovate, round-tipped scales. Leaves short-ovate, short-obovate

to reniform in outline, often broader than long, 6–10 cm. long, 5–13 cm. broad, truncate to deeply cordate at the base, or rarely slightly cuneate on vigorous shoots; sinuately divided into three or five short-oblong lobes, all more or less toothed, the teeth terminating in bristles, the sinuses shallow and open or partially closed; thin when young and deeply tinged with red as they unfold, becoming yellowish-green on both sides, glabrous above and covered beneath with thin floccose pubescence, which is easily detached; at maturity firm, reticulately veined and having prominent mid-rib and primary veins and slender (3–4 cm. long) petioles, and then glabrous on both sides or with traces of pubescence remaining along the mid-rib and veins; turning to a brilliant crimson color in autumn. Fruit sessile, obovoid or short-cylindric; nut full and rounded at the base, rounded or slightly narrowed towards the apex, enclosed for $\frac{1}{5}$ to $\frac{1}{3}$ its length in the shallow saucer-shaped cup, olive-brown somewhat pubescent, 6–12 mm. long, 8–10 mm. in diameter; scales of cup thin, closely appressed, finely puberulent.

This very distinct-looking Oak, in appearance quite unlike any other that I know of, may well prove worthy, when better known, to be regarded as a distinct species. The fact, however, that it has so far been found only in one locality, makes me hesitate to pronounce it such until more is known as to the constancy of its characters and its possible variations under different conditions. The obscurity of characters and the intergradations between other described species and varieties of the group to which it belongs, is an additional reason for conservative treatment at this time.

The shrubs or trees described here were found in open woods and on partially eroded sandstone slopes, often along the edges of cliffs, on top of Magazine Mountain, Logan County, Arkansas, at an altitude of about 850 meters (2800 ft.). Here it was seen only near the north side of the small plateau forming the mountain top, but in the locality it is not rare, scores of specimens having been examined. The general character of the bark, winter-buds, and even of the foliage and fruit, although both of the latter, as pointed out, differ in important details from any of the other described species, clearly indicate its close relationship to *Quercus texana*, *Quercus Shumardii* and its variety *Schneckii*. The generally shrubby habit of this Oak, the small fruit with shallow cups, and especially its peculiar leaves, serve to readily distinguish it from any of its allies. The leaves have, so far as their shape is concerned, a close resemblance to those of the Sugar Maple, which has suggested the varietal name.

Specimens examined are my numbers 24130, Oct. 24, 1923; 24854, May 12, 1924; 26433, 26434 (type), 26437, and 26438, Oct. 8, 1924; 26940, April 26, 1925; and 26920, Nov. 9, 1925. All are in the herbarium of the Arnold Arboretum.

THE VARIETAL¹ CATEGORIES IN BOTANICAL NOMENCLATURE AND THEIR HISTORICAL DEVELOPMENT

ALFRED REHDER

WHEN Linnaeus in his *Philosophia botanica* formulated his definitions of genera, species and varieties, he also laid down rules for the formation of generic and specific names² but he did not propose for varieties names corresponding to his *nomina trivialia*. He contended that varieties do not need to concern the botanist and that they can be excluded from botany,³ but that the more obvious varieties on account of their economic importance may be, if necessary, mentioned by the botanist at the end of the specific diagnosis⁴ while to very slight varieties the botanist pays no attention.⁵ In the examples he gives of varietal names the latter consists in the majority of cases of a phrase, like *flore coeruleo*, *corolla plena*, *foliis sinuosis et variegatis*, *fructu ex rubro et nigro variegato*, etc.

In his *Species plantarum*, however, Linnaeus gives to most of the varieties he mentions a name corresponding to his *nomen triviale* which is placed like the specific name on the margin opposite the diagnosis and is printed in italics while the specific name is printed in roman; the diagnosis of the variety or the synonym which takes its place is preceded by a Greek letter, the first variety starting with β . The named varieties are chiefly those of horticulturally or economically important plants as in the genera *Pyrus* and *Prunus*, but there are also spontaneous plants enumerated as varieties, as *Quercus nigra* β and *Cupressus sempervirens* β ; in these cases as in many others, e. g. *Juglans regia* and *Corylus Avellana*, without a name on the margin. Outside of *Species plantarum* Linnaeus hardly ever mentioned varieties, but apparently replaces when the name is not used in a strictly taxonomic arrangement the Greek letter by the term *varietas*, as in his *Flora rybensis* where he enumerates *Osmunda Lunaria varietas Beckeana*.⁶

Most authors followed the custom of preceding the name of the variety by a Greek or sometimes by a Roman letter or more rarely by a numeral. Curtis in 1792 was probably the first to use the term "var."⁷, as did Stokes⁸ and Watson.⁹ Sims in 1802 used "var." in combination with a Greek

¹ The term "varietal" is used here and throughout the article in a general sense, including all subdivisions below the species.

² The term is used here in its modern sense. It may be pointed out that Linnaeus used the term *nomen specificum* not in the sense of our specific name, but that he understood under *nomen specificum* the phrase (differentia) by which the species is distinguished from all other species of the same genus, while the specific name, as we understand the term now, is his *nomen triviale*.

³ Phil. Bot. § 158: *excludi possent varietates e rei herbaria*.

⁴ Phil. Bot. § 306: *nomini generico et specifico etiam varians si quod addi potest . . . evidetiores varietates ob usum publicum ad finem differentiae insert botanicus, ubi necesse est*.

⁵ Phil. Bot. § 310: *varietates levissimas non caret botanicus*.

⁶ *Amoen. Acad.* VIII. 105 (1785).

⁷ e. g. *Azalea nudiflora* var. *coccinea* in Bot. Mag. XVI. t. 180.

⁸ e. g. *Ulmus surculosa* var. *latifolia* in his Mat. Med. II. 37 (1812).

⁹ e. g. *Quercus Cerria* v. *dentata* in his Dendr. Brit. II. t. 93 (1825).

letter, but placed both in parenthesis¹ which seems to indicate that he did not consider the term var. or its symbol an essential part of the combination and that it might be omitted, as had been done as early as 1770 by Weston who was the first botanical writer to pay much attention to horticultural varieties and to give names to almost all he enumerated; he numbered the varieties and printed their names in italics like Linnaeus did but the numbers did not form part of the combination.² The term var. or its equivalent was also omitted by Schmidt³ occasionally, by Dumont de Courset,⁴ Michaux⁵ and Seringe.⁶

Neither Linnaeus nor any of the older authors give a distinct varietal name to the type of the species; they only named the deviations from the type and started therefore their enumeration with β or its equivalent. This does very well for species with few varieties, but in polymorphous species with many and often subordinate subdivisions, the arrangement of the various forms can be brought out clearer if the species is wholly subdivided into groups and the typical form either designated as *typica*, *genuina*, *normalis* or given a distinct name. One of the first to do this was P. De Candolle in 1818⁷; also Bunge in 1833⁸ did the same.

Each of these methods had its followers and up to now systematic botanists seem to be nearly equally divided on this question. A. De Candolle says: le classement . . . des variétés [se fait] par la série des lettres grecques α , β , γ , etc.⁹ which indicates that he favors the second method, as is also the case in the International Rules if one judges by recom. xxviii. in which the use of a name for the typical subdivision of species is advocated. This second method is, however, opposed by a number of botanists and I may refer here to an article by Britten¹⁰ criticising Dr. Moss' acceptance of this plan in his Cambridge British Flora. Britten says that "the plan which Dr. Moss rejects seems in accordance with that contemplated by the Rules" implying that the other plan does not conform to the Rules, but according to recom. xxviii. as shown above, this does not seem to be the case. It appears to me that either one of the two plans may be followed without violating the Rules. Britten further says that if a species is wholly divided into varieties the binomial becomes an abstraction and is nothing but a synonym of the trinomial name of the

¹ e. g. *Ixia capillaris* (var. γ) *gracillima* in Bot. Mag. xvi. t. 570, but in the index as *Ixia capillaris* var. *gracillima*.

² e. g. *Berberis vulgaris alba* in his Bot. Univ. i. 20, *Aloe margaritifera minor* and *A. margaritifera minima*, l. c. 6.

³ e. g. *Philadelphus coronarius nanus* in his Oesterr. Baumz. i. t. 60 (1792); also *Lonicera Periclymenum serotinum*, l. c. ii. t. 108 (1794).

⁴ e. g. *Quercus rubra latifolia* in his Bot. Cult. iii. 732 (1802).

⁵ e. g. *Quercus Prinus discolor* in his Hist. Arb. For. ii. 46 (1810).

⁶ e. g. *Salix reticulata subrotunda* in his Essai Monog. Saules Suisse, 29 (1815).

⁷ e. g. *Clematis flammula* α . *rotundifolia* in his Syst. i. 134; see also *Hesperis matronalis* α . *hortensis* in his Syst. ii. 450 (1821), and *Brassica oleracea* *A. sylvestris* (l. c. 583).

⁸ e. g. *Amygdalus pedunculata* α . *simplex* in Mém. Div. Sav. Acad. Sci. St. Pétersb. ii. 96 (Enum. Pl. Chin. Bor. 22) (1833).

⁹ in his Lois Nomencl. Bot. 16 (1867).

¹⁰ in Jour. Bot. LIII. 334-337 (1916).

typical form or variety, and he contends that the binomial does not include the varieties, but stands only for the typical form which therefore would not need a varietal designation. As far as I know the general usage, the binomial may include the subdivisions grouped under it or it may stand only for the type, the exact meaning can usually, but not always, be ascertained from the character of the publication or the connection in which the name is used. The existence of a trinomial for the type makes it possible in a species with one or several varieties to state distinctly that one refers only to the typical form exclusive of any variations belonging to the species.

None of the earlier authors distinguished more than one category of varietal names except Persoon who speaks of subspecies and varieties.¹ His subspecies are apparently the subdivisions preceded by a Greek letter, while the term variety is applied to a lower category representing horticultural forms as shown e. g. by the enumeration of forms of *Pyrus communis* as:—*Pyraster*,—*faleria*,—*pompejana*,—*favonia*, etc., preceded by the phrase "Varietates praecipuae sequentes sunt" (Syn. Pl. II. 40); forms of *Pyrus Malus*, *Prunus Cerasus* and *P. domestica* are similarly treated. The first use of subordinate varietal categories I have been able to find is by P. De Candolle in 1818 in his *Systema plantarum*² and still better examples will be found in the second volume of that work published three years later.³ In his memoir of *Brassica oleracea* which he presented in 1821 in a less strictly botanical form to the Horticultural Society of London he distinguishes three categories: stirps (race), varietas and subvarietas. Gaudin in 1830 implied subordination in combinations like *Salix alba* β *sericea* which apparently stands for *Salix alba* β *vitellina* γ *sericea*.⁴ Ortmann in 1835 did not indicate special terms for his subordinate categories, but used roman letters for the first and Greek letters for the second subdivision as in *Tilia grandifolia* c. *obliqua* α . *minor* and β . *major*.⁵ In 1864 A. De Candolle designated the higher category as subspecies and the lower by a Greek letter which no doubt stands for variety as in *Quercus robur* subsp. *pedunculata* α . *vulgaris*⁶ and three years later in his *Lois de la nomenclature botanique* (p. 15) he proposes subspecies (proles), varietas, subvarietas, variatio and subvariatio and for cultivated modifications according to their origin satus, mistus and lusus. In 1876 Debeaux described a *Vitis humulifolia* Forma *glabra*⁷ which may be the first definite use of the term forma, though in 1868 Anderson spoke of formae which are apparently more or less equivalent to his subspecies and modificationes primariae⁸ and Planchon in 1873 had grouped under "Formae pubescentes"

¹ "Varietates praecipuae et subspecies non omissae sunt" in his Syn. Pl. I. (pref.) x. (1802).

² e. g. *Ranunculus bullatus* β *grandiflorus** *pleno flore* in hist Syst. I. 254.

³ e. g. *Hesperis matronalis* α . *hortensis** *albiflora* + *plena* in his Syst. Pl. II. 450 (1821), and *Brassica oleracea* γ . *acephala* β . *vulgaris** *viridis* (l. c. 583).

⁴ in his Fl. Helv. IV. 206.

⁵ in Flora, VIII. pt. II. 502.

⁶ in Prodr. XVI. pt. II. 4.

⁷ in Act. Linn. Soc. Bordeaux, XXXI. 132 (Fl. Tch6-Foû, 37).

⁸ in De Candolle, Prodr. XVI. pt. II. 252 and 253.

several varieties of *Ulmus campestris*.¹ These botanists apparently employed the term *forma* in the same sense as Rouy proposed in 1893,² namely for a group intercalated between subspecies and variety. Later, however, Planchon³ and other botanists, like Kuntze⁴ and Engler⁵ used *forma* for a group below *varietas* and in the Rules of botanical nomenclature adopted by the Vienna Congress the term *forma* was made to take the place of *variatio*, a term too similar to *varietas* and apt to be confused with it particularly when abbreviated. The sequence of the subordinate categories below specific rank is given in art. XII. of these Rules as follows: subspecies, *varietas*, *subvarietas*, *forma*, *individuum*, with the remark, that if the number of groups is insufficient, it may be augmented by intercalation of supplementary groups. Such groups are *proles* (race), placed between subspecies and *varietas*, *subforma*, and below *subforma lusus* and *monstrositas*. In polymorphous species combinations have been published consisting of 5 or 6 or even 7 names as: *Betula alba* subsp. *verrucosa* α . *vulgaris* 3. *microphylla* Regel,⁶ *Pseudomorus Brunoniana* α . *pendulina* subvar. *castaneaeifolia* *variatio scabra* Bureau,⁷ *Lythrum salicaria* α . *intermedium* α . *gracilius* α . *angustius* $\alpha\alpha$. *anceps* Koehne,⁸ *Acer pseudoplatanus* subsp. *typicum* var. *coloratum* subvar. *lutescens* [f.] 23. *flavescens* Schwerin⁹ *Saxifraga aizoon* subsp. *euaizoon* var. *typica* subvar. *brevifolia* f. *multicaulis* subf. *surculosa* Engler & Irmischer.¹⁰ Such polynomials may be useful for classificatory purposes and have their proper place in a monographic treatment of polymorphous species, but as names they are too cumbersome and defeat the purpose of botanical nomenclature whose aim should be to make it possible to designate a given plant in the briefest and most practical and at the same time unequivocal way. It is not practical to give to every form which it may be possible to distinguish a binomial name as was done by Gandoger and to a lesser degree by a few other botanists, but likewise for practical reasons one should certainly not go beyond a trinomial name. That three names should be sufficient for the designation of any given plant is implied in the wording of article 29. of the International Rules and that this is the intended meaning of the article in question was confirmed by Dr. Briquet who states in a letter to me dated April 22, 1912 that one could in quoting e.g. a form omit the names of the inter-

¹ in De Candolle, Prodr. xvii. 156.

² in his Fl. de France, i. p. xi.—In volume x, however, published in 1908 Rouy changed in deference, though under protest, to the decision of the Vienna Congress this term to *race* (*proles*) and dropped the term *forma* entirely (see p. 3, in note).

³ e. g. *Cissus sicyoides* *forma b. oxyodon* in De Candolle, Monog. v. 523 (1887)—That this is intended for a category below the variety becomes clear from his remark on p. 522 "Les formes . . . peut-être quelques-unes pourrout-elles prendre au moins le rang des variétés ou même d'espèces."

⁴ e. g. *Rubus arcticus* f. *grandiflora* in his Meth. Spez. Rubus 147 (1879).

⁵ e. g. *Rhus copallina* α . *latifolia* α . 1. *angustialata* in De Candolle, Monog. iv. 384 (1883).

"Haec forma."

⁶ in De Candolle, Prodr. xvi. pt. II. 163 (1868).

⁷ in De Candolle, Prodr. xvii. 250 (1873).

⁸ in Bot. Jahrb. i. 327 (1881).

⁹ in Gartenfl. XLII. 263 (Var. Gatt. Acer 25) (1893).

¹⁰ in Engler, Pflanzenr. iv.-117, p. 497 (1916).

calated subspecies and variety. As it is not necessary to mention the subgenus and section in a large genus when citing a binomial, so the names inserted between the specific name and the lowest subdivision one wants to quote may be omitted. These names belong to the category which Linnaeus called "nomina muta" as contrasted with the nomina sonora,¹ namely the generic, the specific and if necessary the varietal name. If these intercalated names are omitted, the question, however, arises whether the indication of grade or rank as given in the original combination should be preserved, whether e. g. *Prunus japonica* var. *gracillima* f. *Engleri* Koehne² should be quoted as *P. japonica* f. *Engleri* Koehne which might be considered as suggesting that f. *Engleri* is a form of typical *P. japonica*, which it is not.

In shortening a polynomial in which the subordinate subdivisions are indicated by symbols as *Rosa uriensis* B. *pubescens* Ha. *typica* 2. *gracilis* c. *heteracantha* R. Keller³ it may be cited, as done in Ascherson & Graebner's work, as *R. uriensis* BIIa2c *heteracantha* according to the method explained in the preface, the symbols indicating the position of the third name. This is practically the same method as used in 1830 by Gaudin.⁴ This method of citation is, of course, useful only in reference to the systematic arrangement of the original publication; aside from it, it has no significance and cannot be employed if the combination is used as a valid name in another publication in which it must necessarily conform to the method of classification used therein. It would seem the simplest method in all cases in which such a combination is used or cited without reference to its place of publication, to use the name as a straight trinomial, that is a trinomial without the intercalation of an abbreviation or symbol indicating a certain grade or rank between its second and third component. A trinomial in which the position of the third component is modified by a symbol or abbreviation might be called a modified trinomial. Though many botanists employ the term trinomial exclusively for the kind here called straight trinomial, I prefer to use the term for all combinations of three names, as it was used e. g. by the botanists of Harvard University in the amendments proposed for the Vienna Congress⁵ and as J. Britten⁶ is inclined to use it, who says that "a name consisting of three words for one of two, and this, even if the third word is separated from the two preceding it by the abbreviation "var." seems to me to all intents and purposes a trinomial." Straight trinomials have been used by many botanists and botanical writers since more than 150 years, first probably by Weston.⁷ Of other authors

¹ Phil. Bot. § 12.

² in Sargent, Fl. Wilson. 1. 266 (1912).

³ Ascherson & Graebner, Syn. Mitteleur. Fl. vi. pt. 1. 240 (1902).

⁴ See p. 58, footnote 4.

⁵ Propos. Chang. Lois Nomencl. Bot. p. 18 (1904).

⁶ Jour. Bot. LIII. 334 (1915).

⁷ See p. 57, footnotes 2-6.

besides those cited on p. 57, may be mentioned Alefeld,¹ Anderson,² Planchon,³ Vesque,⁴ Ascherson & Graebner,⁵ Rock,⁶ Trelease,⁷ Reynier,⁸ also T. Fournier speaks in favor of the straight trinomial.⁹ Straight trinomials are the rule in the Philadelphia or American Code which recognizes only one subdivision below the species, called subspecies,¹⁰ while the term variety is relegated to horticultural usage.¹¹ The nomenclature of the varietal categories is further complicated by the habit of some botanists, as Andersson,¹² Ascherson & Graebner,¹³ Rouy,¹⁴ and others to use binomial combinations for subspecies and races.

As the use of binomials for subdivisions of species is not admissible according to art. 28 of the Rules, all such combinations must be considered non-valid and must be credited to the first author who omits the intercalated generic name. This introduces the question of the correct author citation for trinomials and polynomials in regard to which opinions differ considerably. There can be, of course, no doubt that the change of the generic or the specific name in a trinomial constitutes a new combination, but there is apparently much difference of opinion whether 1° the shortening of a polynomial to a trinomial, 2° a change in the varietal category, as the change of a form to a variety, 3° the change of a symbol as numerals or letters to a definite category or vice versa and 4° the omission of the designation of the category or of the symbol, should be considered a new combination which calls for the citation of another author.

In regard to the first case it does not seem to constitute a violation of the Rules to quote the author of a polynomial for the trinomial, since the shortening of a polynomial into a trinomial is permissible according to art. 28, as discussed on p. 59. Neither need the author citation be changed if the case is reversed, as e. g. Pilger credits the combination *Plantago montana* subsp. *atrata* var. *euatrata* f. *elongata*¹⁵ to Thellung, though Thellung published the name as *P. montana* f. *elongata*;¹⁶ nor if the name is

¹ e. g. *Colutea arborescens microphylla* in Bot. Zeit. xxv. 291 (1867), and many instances in his Landwirthsch. Flora (1866).

² e. g. *Salix caprea alpestris* in Kong. Svensk. Vetensk. Akad. Handl. vi. pt. i. 77 (Monog. Salic.) (1867).

³ e. g. *Cissus sicyoides oxyodon* in De Candolle, Monog. v. 525 (1887), in the text under e) *Balansea*, but *C. sicyoides* forma b *oxyodon* on p. 523.

⁴ e. g. *Calophyllum brasiliense longifolium* Vesque, subsp. 2, in De Candolle, Monog. viii. 592 (1893).

⁵ e. g. *Pinus nigra Poiretiana*, Syn. Mitteleur. Fl. ed. 2, i. 333 (1912).

⁶ e. g. *Cyanea scabra longissima* Rock, var. nov., in his Monog. Study Hawaii. Lobel. 259 (1919).

⁷ e. g. *Piper uncinatum leveyanum* Trelease, var. nov., in Jour. Wash. Acad. Sci. xiii. 367 (1923).

⁸ e. g. *Ceratocephalus falcatus brachypetalus* in Monde des Pl. 1923, no. 27, p. 8.

⁹ in Bull. Soc. Bot. France, lxxi. 151 (1924).

¹⁰ e. g. *Sambucus pubens dissecta* Britton, Man. N. Stat. Canada 870 (1901).

¹¹ Canon 4 of the Philadelphia Code; see Bull. Torr. Bot. Club, xxxiv. 167 (1906).

¹² e. g. *Salix nigra* ** *S. amygdaloides* in Kong. Svensk. Vetensk. Akad. Handl. vi. pt. i. 21 (Monog. Salic.) (1867) and *S. grandifolia* l. *S. pubescens*, l. c. 61.

¹³ e. g. *Trifolium medium* l. *T. flexuosum* in their Syn. Mitteleur. Fl. vi. pt. ii. 567 (1908).

¹⁴ e. g. *Quercus pedunculata* sous-esp. *Q. Apennina* in his Fl. de France, xii. 312 (1910).

¹⁵ in Rep. Spec. Nov. Reg. Veg. xxiii. 250 (1926).

¹⁶ in Ber. Schweiz. Bot. Ges. xxiv-v. 235 (1916).

transferred to another subspecies or variety under the same binomial, as e. g. Zahn quotes G. Schneider for the combination *Hieracium alpinum* subsp. *alpinum* var. *pumilum* subvar. *normale* f. *setulosum*,¹ though Schneider published the combination as *H. alpinum* var. *melanocephalum* 4. *setulosum*.²

In the second case the answer depends chiefly on the fact whether we consider the various varietal categories as groups of different rank or of the same rank. Though the majority of botanists who follow the International Rules consider these categories as of different rank, there is apparently no definite statement to that effect in the Rules, neither in articles 10 to 13 in which the arrangement of subordinate groups of the plant kingdom is carried to 21 degrees nor in article 49 which deals with changes of rank and where nothing is said of the change of one subdivision of a species to another subdivision, but only the change of a species to a subdivision of a species or vice versa is mentioned. One source of the opinion that the different subordinate subdivisions of a species are of different rank may be the English translation of the Rules which employs the term rank for the term "degré" as used in the original French text in article 12 and 28 and also for "rang hiérarchique" as used in article 49. Some authors apparently consider the different subordinate subdivisions below the species as one nomenclatorial class and take the oldest name, whether published as a variety or form, but cite the change from a lower to a higher subdivision or vice versa as a new combination; e. g. Pampanini in proposing as new the combination *Gentiana verna* var. *magellanica*,³ takes the oldest combination *G. verna* f. *magellanica* Ronniger (1916) and not *G. verna* var. *Tenoreana* Vaccari (1917) or var. *vexans* Fiori (1926), though he should have accepted var. *Tenoreana* as the oldest name published as a variety, if he had considered forma and varietas as constituting different ranks. I have discussed the same subject several years ago in this Journal (I. 46) proposing the term grade for the different degrees of varietal categories, and advocating the same course which Pampanini, took, but I am doubtful now if the author citation should be changed, as long as we do not consider these subdivisions as of different rank. A similar opinion was voiced by botanists of Harvard University in their proposed amendments to the Paris Code⁴: "Subspecies, varieties and forms are not sharply definable or mutually exclusive categories, it is therefore better that, although their separate rank is maintained for classificatory purposes their names should be regarded as forming a single nomenclatorial class." There is also to be considered that the term variety as used by one author may correspond to the subspecies of other authors, or as used by a certain author it may correspond to the term forma of other authors, or speaking generally the same term may mean different things

¹ in Engler Pflanzenr. iv-280 (*Hieracium*) 624 (1921).

² in Oester. Bot. Zeitschr. xxxvii. 202 (1887).

³ in Bull. Soc. Bot. Ital. 1926, p. 42.

⁴ See p. 60, footnote 5.

with different authors, and different terms as used by different authors may mean the same thing.

In regard to the third case it may be stated that it is in many instances not clear which category the symbol represents; even the Greek letters which traditionally are taken to stand for *varietas* may stand for subspecies as in Persoon's *Synopsis*¹ and in Andersson's publications² who calls these subdivisions subspecies or *modificationes primariae* or more often *formae*, or for *subvarietas* or *forma* as used by Planchon,³ while Roman letters may be employed for varieties. In many instances it is hardly possible to know whether in polynomials of which the subordinate subdivisions have only numerals and letters, the first subdivision is a subspecies and the following a variety or whether it is a variety and the following a subvariety or a form.

In regard to the fourth case it is to be considered that there are many instances in which the authors themselves have published the combination as a straight trinomial but with a definite statement as to the rank or grade⁴ or in which they have published the combination as a modified trinomial, but later when they mention or cite the combination use it as a straight trinomial.⁵ In such cases there can be, of course, no doubt that the author citations should be the same for both kinds of trinomials. But also in the other case when changing a straight trinomial to a modified one or vice versa, there seems to be little justification for changing the name of the author, for there is not even a change of rank or grade involved which might according to the prevailing interpretation of the International Rules call for a change of author citation. Nor are straight trinomials prohibited by the International Rules as some botanists seem to believe; the only passage which might be constructed that way reads "Not to publish a name . . . without expressing an opinion on the nature of the group to which they give the name," but that is only a recommendation (recom. XVIII) and not a rule.

It is often said that one should not make an author say what he did not say, and this is an excellent rule for citations of literature and synonyms and should be followed rigorously. There is no justification for citations of synonyms as they are given e. g. in the "North American Flora" where all trinomials are cited as straight trinomials and also otherwise the names are not cited exactly as originally published. A synonym should be cited exactly as published even without change of capitalization, gender or occasional misprints. We have, however, to distinguish between citation and use of a name or combination of names. If an author adopts or uses a certain name, it has to conform to the style of his work; if he considers

¹ See p. 58, footnote 1.

² in De Candolle Prodr. xvi. pt. II. 252 (1868); see also Kong. Svensk. Vetensk.-Akad. Handl. VI. no. I. 61, etc. (1867).

³ e. g. *Ampelopsis heterophylla* var. *Bungei* subvar. *α. Sieboldii* in De Candolle, Monog. Phan. v. 456 (1887).

⁴ See p. 61, footnotes 4, 6, 7.

⁵ See p. 61, footnote 3.

e. g. *Evonymus* as of feminine gender, he has to change *E. alatus* Regel to *E. alata*, though this would not justify him to change the author citation. If he adopts the spelling *Stigmaphyllum* he has to write *Stigmaphyllum Selerianum* Niedenzu, though Niedenzu published the name as *Stigmatophyllum Selerianum*.¹ If he used definite designations for the different varietal categories he will have to make the change from numerals or letters in many combinations and will have to make other changes to make the names conform to the arrangement he adopted in his publication. These changes do not or should not call for a change in author citation, but yet they make an author say what he did not say. Only if we quote the name in the synonymy, are we able to give an exact citation, and it is only for citation in synonymy, that the rule can be strictly applied.

In changing a polynomial to a trinomial a certain difficulty is presented by polynomials like *Prunus glandulosa* var. *glabra* f. *Sieboldiana* subf. *rosea* Koehne² in which var. *glabra* represents the type of the species, f. *Sieboldiana* the type of var. *glabra* and subf. *rosea* the type of f. *Sieboldiana*. If we take the lowest subdivision for the trinomial, the type of the species would be called *P. glandulosa* subf. *rosea* or *P. glandulosa rosea*; if it is the intention to designate the group which includes both subforms *rosea* and *alba*, *P. glandulosa* f. *Sieboldiana* or *P. glandulosa Sieboldiana* would be the name; if we want a name for the group which includes both forms f. *Sieboldiana* and f. *albiplena*, *P. glandulosa* var. *glabra* or *P. glandulosa glabra* would be the proper name. This means that we have here three groups based on the same type, differing only in their narrower or wider circumscription or in other words in the exclusion of certain elements or the additions of new elements which according to art. 44 of the International Rules does not warrant a change in the name or names of the group. That groups based on the same type should have the same name, is also evident, if we accept the proposition that the different subordinate subdivision of a species should be considered as belonging to one nomenclatorial class. In many cases one of the names will be older than the others and that name will thus be the valid varietal name, but in the example cited above, all names are of the same age and in that case the author who first unites them chooses according to art. 46 of the Rules. Some authors in naming subordinate groups based on the same type have followed the method which seems to be the best and simplest, namely of using the same name for the subordinate groups as e. g. in the combination *Andropogon caricosus* subsp. *mollissimus* β . *mollissimus* Hackel.³ In such a case the trinomial can be made to indicate the wider or narrower circumscription of the group by indicating the grade, for *A. caricosus* var. *mollissimus* would show that the group is taken in a narrower sense than *A. caricosus* subsp. *mollissimus*.

¹ in his *Gen. Stigmatoph.* II. 7 (1900).

² in *Sargent, Pl. Wilson.* I. 263 (1912).

³ in *De Candolle, Monog.* VI. 569 (1889).

Considerable diversity of usage exists in the naming of the varietal categories representing the type of the species. Art. 28 rules that "names of subspecies and varieties are formed like specific names and follow them in order." Recommendation XXVIII. under art. 46 dealing with union of groups reads "When several species are united as subspecies or varieties under a collective name that subdivision which was first distinguished or described may retain its name (ex.: *Saxifraga aspera* subsp. *aspera*) or bear a prefix (*Alchemilla alpina* subsp. *eu-alpina*) or be designated by some customary title (*normalis*, *genuinus*, *typicus*, *originarius*, *verus*, *veridicus*)." Though this recommendation deals with the union of related species, it applies as well to the splitting of a polymorphous species into subordinate groups, since the resulting classification or taxonomic arrangement is the same whether it was arrived at from synthesis as in the former or from analysis as in the latter case. The prefix or the customary titles enumerated above may be given in the latter case to the typical group. A distinct name has its advantages when the phylogenetic type is not at the same time the nomenclatorial type of the species as is the case in many instances and is particularly evident in species based originally on a monstrosity as *Viburnum macrocephalum*, *Hydrangea macrophylla*, *Rosa Roxburghii*, *R. xanthina*, *R. hemisphaerica*. In such cases the normal form has been often distinguished as f. *normalis* or f. *spontanea* and the nomenclatorial type as f. *plena* or f. *sterilis*. Terms like *typicus*, *verus*, *veridicus* should be reserved for the nomenclatorial type. In this connection it may be pointed out that division 3 of article 51 which says that everyone should refuse to admit a name when it is based on a monstrosity, could be interpreted as invalidating the names mentioned above as they are without doubt based on monstrosities, though their validity has never been questioned. Even *Uropedium* Lindley mentioned as example under article 51 may be retained "charact. mutatis" as the oldest name for *Phragmopedilum* Rolfe.

Varieties of hybrids present another vexing question of nomenclature which is complicated by the custom of some botanists to give names, when using a formula for the designation of a hybrid, to forms of the hybrid and append them to the formula. This does not appear logical, for a varietal name presupposes the existence of a binomial to which it is to be attached, and besides, this practice is extremely confusing, as such a combination does not differ in appearance from a formula of which the second component is a binomial with a varietal name, e. g. *Salix caprea* × *daphnoides* var. *pulchra*¹ does not differ from *S. myrtilloides* × *repens* f. *submyrtilloides*,² though in the first case the varietal name stands for a variety of *S. daphnoides*, while in the second it represents a form of the hybrid. The wording of art. 34 of the International Rules might possibly be interpreted as allowing the use of a varietal name under a formula, but I do not think

¹ Gürke in Richter, Pl. Eur. II. 24 (1897).

² Abromeit in Schrift. Phys.-Oekon. Ges. Königsberg, XLVI. 68 (1905).

that this is the intention of the rule, since in the examples only a case of a binomial with a variety, namely \times *Mentha villosa* β . *Lamarckii* is cited, and a formula of which the variety belongs to the second component, namely *Salix caprea* \times *daphnoides* var. *pulchra*. To what utterly confusing nomenclature these formulas with varietal names attached may lead is shown by some combinations published by R. Keller who enumerates under *Rosa gallica* \times *glauca* three forms A. *typica*, B1. *complicata* and B11. *myriodonta*,¹ based on *R. gallica* \times *glauca* f. *typica*, var. *complicata* and var. *myriodonta*,² though in the latter case the varieties are varieties of *R. glauca*³ and not of the hybrid. According to my opinion Keller's names can not be considered correct, since he used these varietal names in a different sense and for different plants; he should have given new varietal names, as he did correctly in other instances, e. g. with *R. coriifolia* var. *complicata* \times *gallica* M. Schulze (l. c. 56) which he changed to *R. gallica* \times *coriifolia* f. *complicatoides* (l. c. 290). There was, however, no justification for changing Schulze's *R. coriifolia* f. *typica* \times *gallica* f. *aprica* (l. c. 55) to *R. gallica* \times *coriifolia* *apricoides*, since Schulze's f. *aprica* is a form of the hybrid and not of *R. gallica*. If both kinds of combinations should be considered admissible under the Rules, there should be at least some sign or abbreviation inserted to distinguish between varietal names belonging to the last component of the formula and those representing a subdivision of the hybrid. The same proposition would apply to the author citation, since it is not always clear, whether the author cited belongs to the last name of the formula or to the formula as a whole, i. e. to the hybrid.

In regard to the supposed distinction between horticultural and botanical varieties or forms I refer to my remarks in the first volume of this Journal (p. 48) where I state, that I can find no fundamental difference between a form which originated in the wild and one which originated in a garden, but that there is a difference in the standing and in the use of fancy garden names and in that of botanical names.

Considering the great diversity in the attitude toward the varietal categories almost from the beginning of Linnaean nomenclature, it seems advisable to allow the greatest possible latitude in the use and employment of varietal names: e. g. that anyone who wants to use straight trinomials may do so and one who insists to attribute a distinct grade to a varietal subdivision may also do so, without having the right to change the name even if he assigns a distinct grade to a varietal category or changes a lower grade to a higher one or vice versa. I am also in favor of retaining the name of the original author, though I concede that in this respect there may be points in favor of the opposite opinion. Author citation, anyhow, is a matter of secondary importance and is of practical importance chiefly for the reason that it gives a more or less definite clue to the time and

¹ in Ascheron & Graebner, Syn. Mitteleur. Fl. vi. pt. i. 288 (1902).

² M. Schulze in Mitt. Geog. Ges. Jena, v. Bot. Ver. Gesamthür. p. 51, 52 (1887).

³ M. Schulze (l. c. 33, 34) attributes these combinations under *R. glauca* to Christ, but Christ published these varieties under *R. Reuteri* Godet.

place when or where the name was proposed and also enables one, if the name has been used twice or oftener for different plants, to state exactly which plant is meant by it. I do not think that much emphasis should be placed on sentimental reasons for the citation of authors' names, such as to give some measure of enduring recognition to the author who coined a new name or made a new combination; this sentimental and also the juridical aspect of nomenclature was stressed particularly by O. Kuntze and his often very acrimonious utterances in this respect discredited to a great extent his proposed reforms of botanical nomenclature in the eyes of many botanists and prejudiced them against their acceptance. Consideration of the practical significance of the authority should also lead, if an abbreviated author citation is desired or necessary, to abbreviate, a citation such as *Mikania Karsteniana* Klotzsch ex Hieronymus¹ to *M. Karsteniana* Hieron. rather than to *M. Karsteniana* Klotzsch, because the latter citation would infer that the name could be found in a publication by Klotzsch and furthermore that the name was published before 1860, while in reality it was published 40 years later. The fact that Klotzsch wrote the name some time before 1860 on a herbarium specimen is comparatively unimportant, while the fact that Hieronymus published the name in 1901 with a descriptive note is of much greater importance. We do not cite *Pinus inops* Aiton ex Bongard but *P. inops* Bong. when quoting the name as a synonym of *P. contorta* Dougl., though Bongard credited the name to Aiton. The citation *P. inops* Bong. in this case is to the point, but in the citation of literature, the names should be cited exactly as published and the full citation of this name should read: *Pinus inops* Aiton ex Bongard in Mém. Acad. Sci. St. Pétersb. ser. 6, II. 163 (1833) which shows at once that Bongard referred the plant, though erroneously, to *P. inops* Ait. and did not intend to describe a new species and therefore his name is not a homonym, but *P. inops* Ait. pro parte, quoad nomen, and it can not replace *P. contorta* Dougl. for the reason that *P. inops* Ait. is a synonym. Particularly in regard to the citation "Hort." the publishing author is of paramount importance, since "hort." does not give the slightest clue to time or place of the origin of the name; moreover it often happens that different plants may bear the same name in different gardens and only by citation of the publishing author we are able to know for which plant the name should stand.

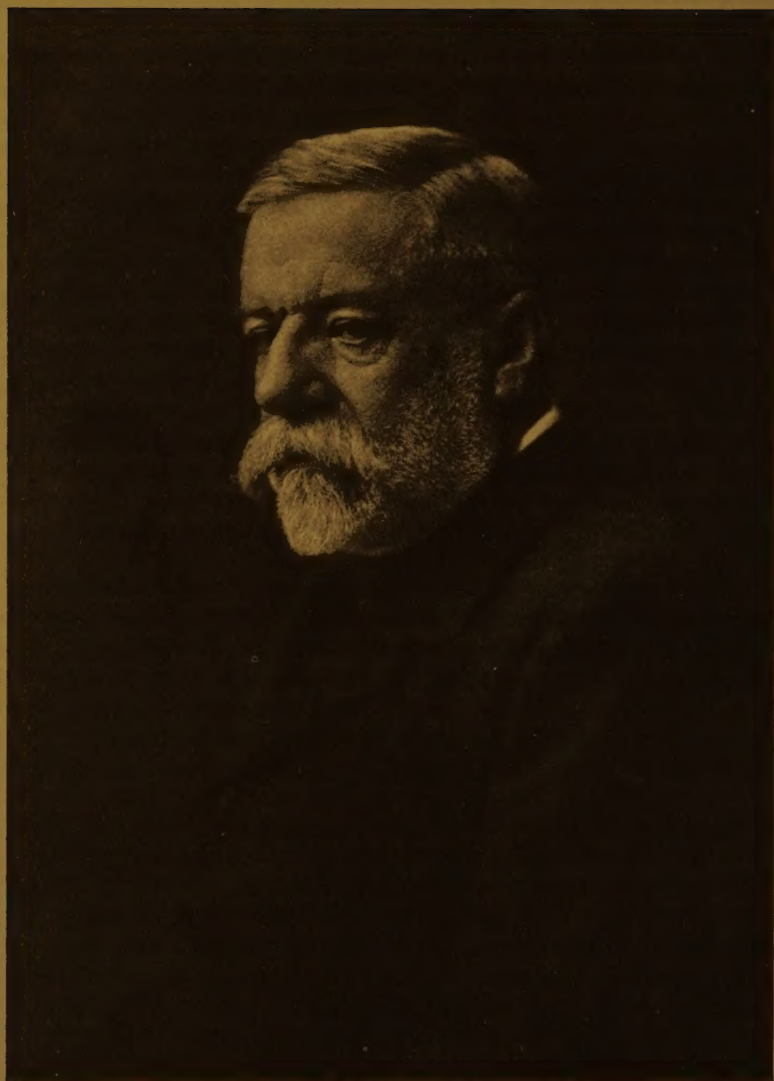
The suggestions made in the preceding pages regarding some modifications in the International Rules present no changes in the fundamental principles and the suggested modifications could be taken care of by changes in or additions to the recommendations and by additions of a few more examples to interpret more clearly the rules and recommendations which are admittedly vague in some instances and particularly so in respect to the nomenclature of varieties. This vagueness is possibly in some cases more or less intentional, since a stricter and clearer definition of disputed

¹in Bot. Jahrb. xxviii. 581 (1901).

points might have lead to endless discussion and jeopardized the general acceptance of the code by the International Congress. It would seem wise to relate the codification of general practices which may not meet with unanimous approval to recommendations rather than to rules, particularly as there exists no power to enforce the rules and even if there is some kind of retaliation against offenders possible, it is not used as it possibly might e. g. in regard to article 36^{bis} which rules that Latin diagnoses for new groups are obligatory. I doubt very much, if anyone would republish with Latin diagnoses and new names groups published by another author with descriptions in a modern language, that these names would be accepted, though according to a strict interpretation of the rules they should. The less opportunity is given by avoiding too much and too strict legislation, to disregard laws or rules, the easier it will be to win adherents to a certain code of nomenclature who will faithfully follow the rules and at the same time will be guided by the recommendation, even if they do not accept every single one of them.

NOTES

Pottsia grandiflora (see p. 15). When these pages were ready for the press, no. 89 of the Notizblatt of the Berlin Botanic Garden reached us with the description of *Pottsia grandiflora* Markgraf based on H. H. Hu's no. 1067 from southern Kiangsi. This on examination proved to be identical with the new species of *Pottsia* described on page 15 of this number by Dr. Merrill, who by a remarkable coincidence had selected the same name as Dr. Markgraf for this species.—A. R.



C. S. Sargent